Owner's Operating Manual

REFLECTION

VX-5c

Digital Light Processing Projector
and VHD™ Ultra Controller

RUNCO

The World's Finest Home Theater Products ™

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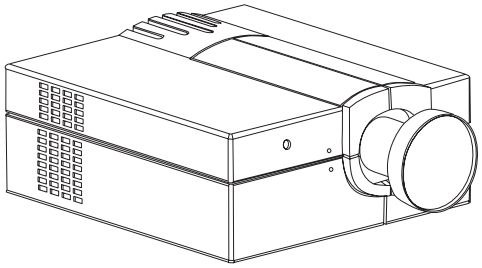
INTRODUCTION

The **VX-5c projector** is a professional quality DMD™ projector that uses Digital Light Processing™ (DLP™) technology from Texas Instruments to achieve high-brightness multimedia and video projection. Both models are compatible with standard international video formats and can interface with IBM™-compatible PC, Macintosh™ computers and high-definition (DTV) decoders. The VX-5c is ideal for use in large audience venues in which there may be high levels of ambient light, such as in corporate boardrooms, auditoriums, and large theaters with large screens.



The features of the VX-5c include:

- Includes the VHD Ultra Controller for optimum picture quality when using NTSC sources
- 1280 x 1024 native resolution, with other resolutions fully scaleable
- 3000 ANSI lumens light output
- Contrast ratio of greater than 250:1 ANSI, 400:1 full field
- Tandem horizontal and vertical sizing software control
- Independent vertical stretch for changing aspect ratios
- Interchangeable lenses for diagonal screen sizes up to 40 or more feet
- Memory for up to 99 custom “channels” (source setups)
- Intuitive on-screen menus or hidden direct control
- Input switching with keypad
- Built-in RS-232 and RS-422 ports for computer control and networked projectors
- Modular design for easy servicing.

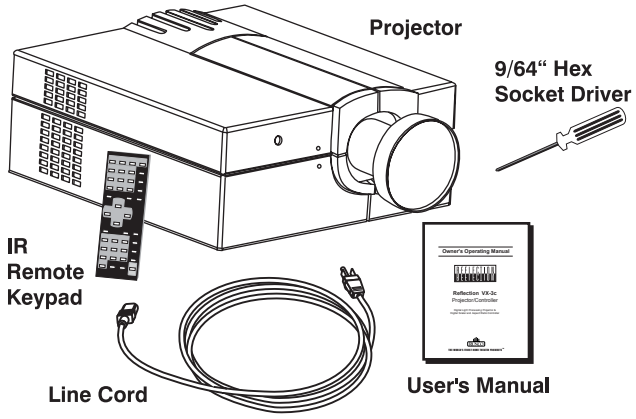
How The Projector Work?

The VX-5c can accept data/graphics and video input signals for projection on to front or rear flat screens. High brightness light is generated by an internal 700W Xenon arc lamp, then modulated by three DMD (digital micromirror device) panels that provide digitized red, green or blue color information. Light from the “on” pixels of each panel is reflected, converged and then projected to the screen through a single front lens, where all pixels are perfectly superimposed as a sharp full-color image.

INTRODUCTION

1.2 Components

Included with the VX-5c is an infrared (IR) remote keypad, high-current 13 amp rated line cord, a 9/64" hex socket ball driver, and a VX-5c owner's manual. Make sure that you have all these items, and note that if you have purchased this projector, a purchaser's Warranty Registration Card is also included. Complete this card and return it directly to Runco International as soon as possible.



1.3 Purchase Record and Servicing

Whether the projector is under warranty or the warranty has expired, Runco's extensive factory and dealer service network is always available. Runco service technicians and dealers are fully trained to quickly diagnose and correct projector malfunctions.

Should you encounter a problem with the projector and require assistance, contact your Runco dealer or Runco International. In many cases, any necessary servicing can be performed on site. If you have purchased the projector, fill out the information below and keep with your records.

Purchase Record

Dealer:	
Dealer Phone Number:	
Projector Serial Number*:	
Purchase Date:	
Installation Date, if applicable:	

** NOTE: The projector serial number is located on the projector's rear identification label*

INSTALLATION & SETUP

This section explains how to install and set up the projector. If you are familiar with the projector and want to quickly set it up for temporary use, follow the Quick Setup instructions below. For a more complete setup, follow the instructions and guides covered in the remaining subsections.

NOTE: 1) The lens is not mounted when the projector is shipped from the factory. For instructions on how to install or replace a lens, refer to ***4.5, Replacing the Lens****.*

2.1 Quick Setup

Follow these steps for quick setup of the projector in a standard floor mount position.

STEP 1 ⏩ Position the Projector

Set the projector at the expected throw distance (projector-to-screen distance) and vertical position. See *2.3, Projector Position and Mounting and Appendix E.* Make sure that the projector is level from side-to-side (see *2.7, Leveling*).

STEP 2 ⏩ Connect a Source

Locate the main input panel at the rear of the projector. The lower left area, labeled **INPUT 1**, accepts an RGB input via BNC connectors. The upper right area (assuming a video decoder is installed) accepts a composite video at **INPUT 3** or S-video input at **INPUT 4**. Connect your source to the appropriate panel connectors.

STEP 3 ⏩ Connect the Line Cord to AC Power

Connect the projector's 13 amp high-current rated line cord to the AC receptacle at the lower right corner of the projector and to AC. Input power required is 100 - 240 VAC, 50 to 60 Hz @ 11.5 amps (@ 100 V). ***Use only a high-current 13 amp rated cord.*** See ***Section*** 5.

WARNING

Do not attempt operation if the AC supply and cord are not within the specified voltage and power range.

STEP 4 ⏩ Turn the Projector ON

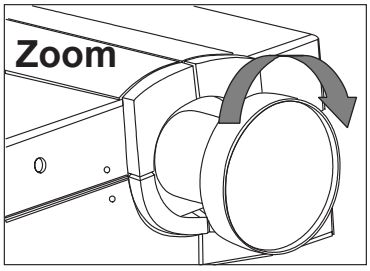
Using either the built-in or remote keypad, press Power* and hold for approximately 1 second to turn the projector on (or press Power* ▲ON). Let the projector warm up for about five minutes. The **POWER** LED, located in the lower right corner of the rear input panel, should glow a steady green.

STEP 5 ⏩ Select a Source

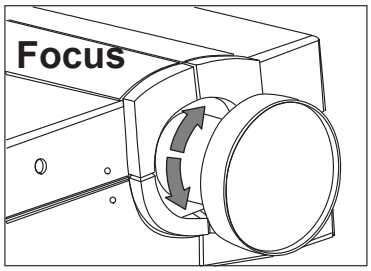
Using either the built-in or remote keypad, press Input1 , Input1 , Input1 , or Input1 to select and display the image for the source you connected in Step 2. The display will resize as needed, producing an image as large as possible for the type of source present.

INSTALLATION AND SETUP

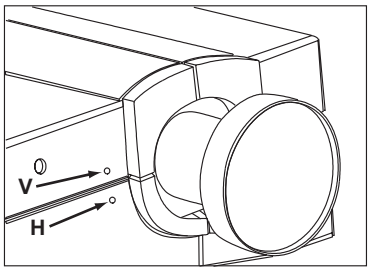
STEP 6 ⏩ Adjust Image



● **ZOOM:** With the input image displayed, rotate the textured ring on the lens barrel to increase or decrease the image size (this requires a zoom lens). If you don't have a zoom lens or you can't adjust the image enough, the projector may not be positioned at the proper throw distance for your screen size. Power down, unplug the projector and move it towards or away from the screen. See *2.3, Projector Position and Mounting* for details.



● **FOCUS:** At the lens opening, turn the focus tab to focus the image clearly.



● **OFFSETS:** Turn either or both of the adjustment screws (with the provided hex driver) adjacent to the lens if you need to align the image with your screen-turn the top screw to raise or lower the image. Turn the bottom screw to shift the image left or right. Re-check focus.

● **OTHER:** Press Menu to refine other display parameters as described in *Section 3*.

2.2 Installation Considerations

Although this projector delivers a high brightness quality output, final display quality could be compromised if the projector is not properly installed. This subsection discusses issues you should consider before proceeding with a final installation. Even if you do not intend to use the projectors in a fixed and permanent installation, this subsection will help you to better understand what you can do to enhance display performance.

Lifting

For any new installation, you will likely have to safely lift the projector into place. Keep in mind that the projector is quite heavy, and the aid of a CO2 or other type of mechanical lift is highly recommended.

Installation Type ⏩

Choose the installation type which suits your needs: front or rear screen, floor mount or inverted mount.

Front Screen, Floor Mount Installation

ADVANTAGES	CONSIDERATIONS
Chapter 1 Easy to set up	***Chapter 4 Shares floor space with audience***
Chapter 2 Can be moved or changed quickly	
Chapter 3 Easy to access	

Front Screen, Inverted Mount (ceiling) Installation

ADVANTAGES	CONSIDERATIONS
Chapter 5 Does not take up audience space	***Chapter 8 Installation is more permanent***
Chapter 6 Projector is unobtrusive	***Chapter 9 It is more difficult to access the projector***
Chapter 7 Projector cannot be accidentally moved	

Rear Screen, Floor Mount Installation

ADVANTAGES	CONSIDERATIONS
Chapter 10 Projector is completely hidden	***Chapter 13 Requires separate room***
Chapter 11 Projector is easily accessed	
Chapter 12 Usually good ambient light rejection	

Rear Screen, Inverted Mount (ceiling) Installation

ADVANTAGES	CONSIDERATIONS
Chapter 14 Projector is completely hidden	***Chapter 16 Requires separate room***
Chapter 15 Usually good ambient light rejection	***Chapter 17 Installation cost is usually higher***

Rear Screen, Floor Mount with Mirror

ADVANTAGES	CONSIDERATIONS
Chapter 18 Projector is completely hidden	***Chapter 21 Requires separate room***
Chapter 19 Usually good ambient light rejection	***Chapter 22 Installation cost is usually higher***
Chapter 20 Requires less space behind screen than other rear screen installations	

Screen Type ⏩ Front Screen Installations

While there are two basic screen types, flat and curved, generally flat screens are recommended for this projector. Flat screens offer a gain of about 1 with a viewing angle just less than 180°. The image is diffused equally in all directions so the audience can see the display from various angles. Because of the low gain, flat screens are most effective when ambient lighting is reduced, although this difference may be negligible given the high brightness output from this projector.

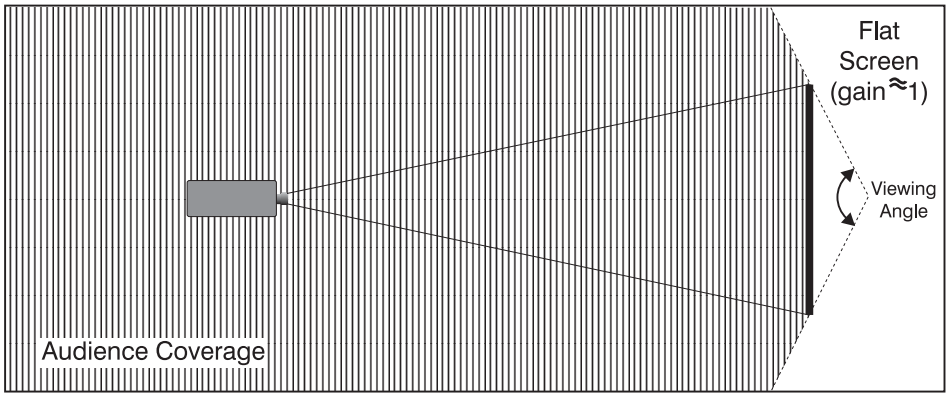


Figure 2.1. Audience Coverage with Flat Screen

NOTE: Lenses for this projector are designed primarily for use with flat screens, but the projector depth-of-field range allows the lens to be focused on curved screens as well. While focus remains sharp in the corners, there may be significant pincushion distortion, primarily at the top of the screen.

Rear Screen Installations

There are two basic types of rear screens: diffused and optical. A diffused screen has a surface that evenly spreads the light striking it. Purely diffused screens have a gain of less than 1. The main advantage of the diffused screen is its wide viewing angle, similar to that of a flat screen for front screen projection. Fresnel lenticular screens take light from the projector and redirect it to increase the light intensity at the front of the screen. This reduces it in other areas. A viewing cone, similar to that of a curved front screen installation, is created.

To summarize, Fresnel lenticular screens are better suited for brightly lit rooms where the audience is situated within the viewing cone. Diffused screens may be better suited when a wide viewing angle is required but there is low ambient room lighting.

Screen Size ⏩

Screen size may be from 5 to 40 feet diagonal, depending on the lens you are using. For instance, a 1.2:1 lens can produce a 5 to 25 foot image size, whereas a 4-7:1 zoom lens produces an 8 to 40 foot image size. Choose a screen size that is appropriate for your lens and application. Keep in mind that if the projector will be used to display text information, the image size must allow the audience to recognize all text clearly. The eye usually sees a letter clearly if eye-to-text distance is less than 150 times the height of the letter. Small text located too far from the eye may be illegible at a distance no matter how sharply and clearly it is displayed.

To fill a screen with an image, the aspect ratio of the screen should be equal to the aspect ratio of the image. The aspect ratio of an image is the ratio of its width to its height. Standard television has a 4:3 or 1.33:1 aspect ratio. For example, to display a television image with a 4:3 aspect ratio onto a 10 foot (3m) high screen, the width of the screen must be at least 13.3 feet (4m).

Note: Screen size is often specified as diagonal size. Screens specified by diagonal size have aspect ratios of 4:3. Screens with other aspect ratios, such as 16:9, are not typically specified by diagonal size, instead they are specified by height and width.

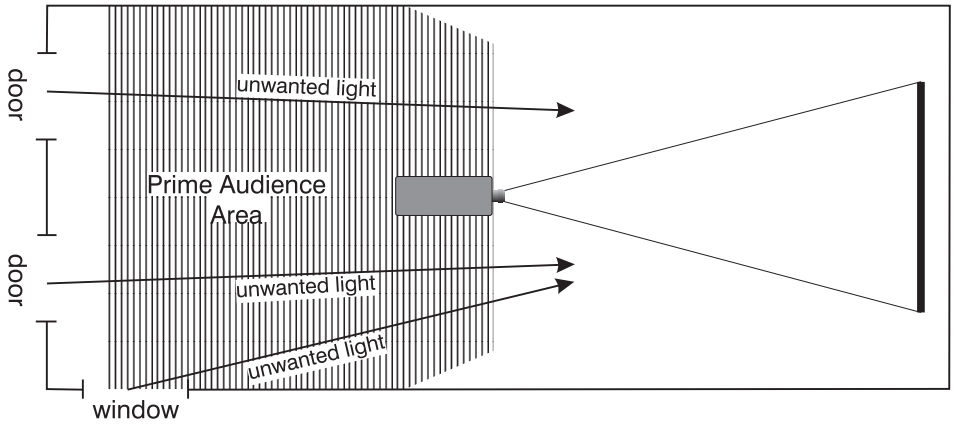


Figure 2.2. Poor Screen Placement

Ideal Room Lighting ⏩

The high brightness output of this projector is certainly well suited for locations where ambient lighting is less than optimum for projection, yet there are still many simple things you can do to optimize your installation.

Visiting a movie theater can give you an idea of what makes an ideal projection environment. Walls, floors and furnishings are dark and have a matte finish. A projection room should not have white reflective ceilings or non-directional lighting, such as fluorescent lights. The white ceiling spreads light, making the room appear brighter. Keep lighting and reflections to a minimum.

If it is not possible to eliminate fluorescent lights, consider using incandescent spot lighting or parabolic reflectors ("egg crates") to direct light down to the floor. Light dimmers or rheostats allow further control.

Outside windows are undesirable in any projection room. A small crack between curtains on a sunny day can wash out a projected image. If you do have windows, make sure that window coverings are opaque and overlapping - some window coverings are designed to provide up to 100 percent blockage of outside light. Ideally, the material should have a matte finish.

To minimize the effects caused by unwanted light from door and aisle ways, carefully choose the position of your projector and screen. Figure 2.2 shows an installation where poor screen placement allows too much unwanted light to enter the screen. In Figure 2.3, screen and the projector are positioned so that unwanted light is minimized.

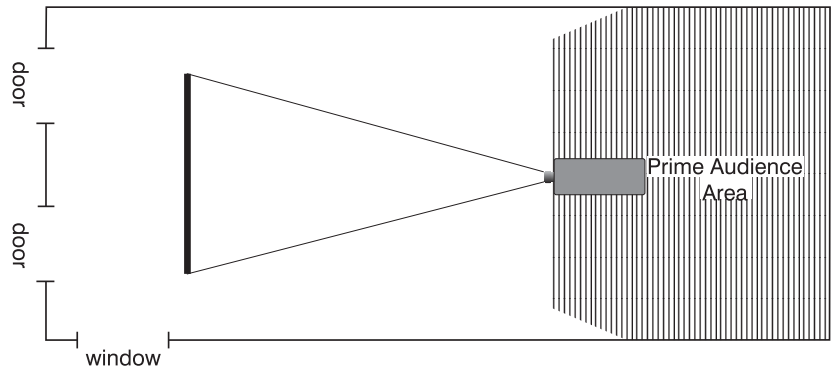


Figure 2.3. Better Screen Placement

Even with all lighting removed it is still possible that room reflections within the room can slightly degrade the image. Light from the projection screen should be absorbed by the ceilings, walls and floors so that it will not be reflected back to the screen. Again, keep reflective surfaces to a minimum.

Other Considerations ⏩

Here are some other considerations and tips which can help you improve your installation:

- Ventilation is an important factor when preparing a projection room. The ambient temperature should be kept constant and below 35°C (95°F). Keep the projector away from heating and/or air conditioning vents. Changes in temperature can cause drifts in the projector circuitry that may affect performance.

- Keep the projector away from devices that radiate electromagnetic energy such as motors and transformers. Common sources of these are slide projectors, speakers, power amplifiers, elevators, etc.

- For rear screen applications, less space is required if a mirror is used to fold the optical path.

- Choose the right screen size for the application:

  △ As screen size increases, magnification increases and reduces brightness. Select a screen size which is appropriate for the venue, but not larger than that required.

  △ Installing a large screen in a small room is similar to watching television close up; too large a screen can overpower a room. A good rule of thumb is to be no closer than 1.5 times the width of the screen.

  △ Larger screens require greater attention to lighting conditions.

- When laying out the projection room, consider positioning the projector and screen in a manner that will achieve maximum audience coverage and space efficiency. For example, placing the screen along the larger wall in a rectangular room will reduce audience coverage. Figure 2.4 shows two examples of how audience coverage is maximized.

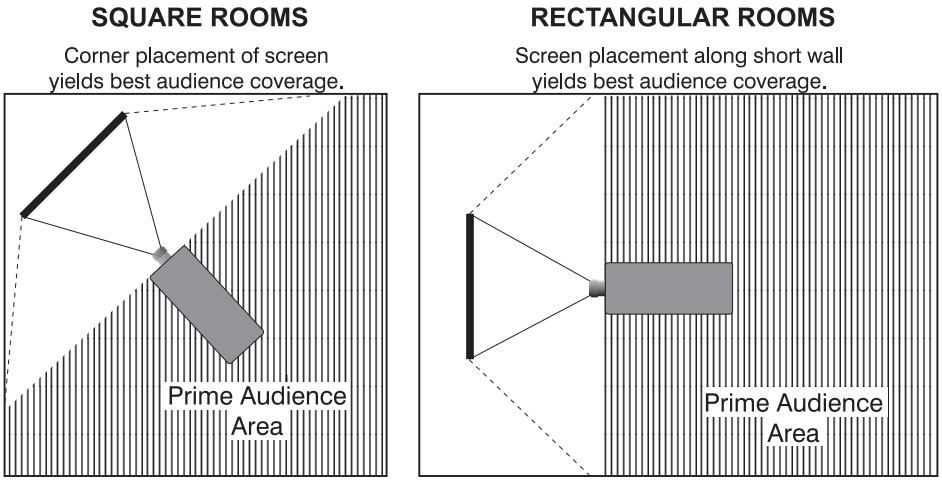

SQUARE ROOMS
Corner placement of screen yields best audience coverage.
Prime Audience Area
RECTANGULAR ROOMS
Screen placement along short wall yields best audience coverage.
Prime Audience Area

Figure 2.4. Screen Locations for Maximum Audience Coverage

2.3 Projector Position and Mounting

Installation type, screen type, and lighting all affect where the projector is positioned. In addition, both throw distance (the distance between the projector and screen) and vertical position (the height of the projector in relation to the screen) must be determined for every new installation. Both depend on the screen size and lens type you are using. Make sure that the room can accommodate the required position of the projector for the chosen screen size.

Throw Distance ⏩

Throw distance is the distance between the projector's front feet and the screen. For any installation, an accurate throw distance must be determined in order for the image to be of the right size for your screen-the farther the projector is from the screen, the larger the image.

NOTE: If your projector is tilted in relation to the screen, as is sometimes the case for large venues or elevated installations, throw distance still represents the smallest measurement between the screen and lens.

Screen ⟷ x Lens Type = Approx. Throw Distance

Throw distance is roughly equal to the horizontal width of the screen multiplied by the type of lens you are using. For example, if you are using a 0.8:1 lens, proper throw distance will be approximately 0.8 x the screen width. Once you know your screen size and lens, you can estimate throw distance needed (see example in Figure 2.5).

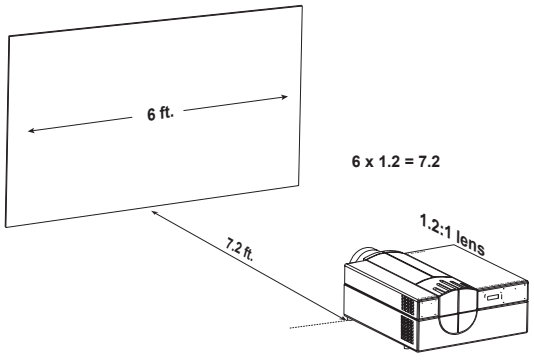


Figure 2.5. Estimating Throw Distance (SEE APPENDIX D)

*IMPORTANT: For proper placement in an installation, always refer to the throw distance formula and/or graph for your lens as listed in **Appendix E**. Keep in mind that due to lens manufacturing tolerances for lens focal length, actual throw distance can vary ±5% between lenses described as having the same throw ratio.*

INSTALLATION AND SETUP

Vertical & Horizontal Position ⏩

THE VERTICAL POSITION of the projector in relation to the screen also depends on the size of the screen and the lens type. Correct vertical position helps ensure that the image will be rectangular in shape rather than keystoned (having non-parallel sides) and that image focus and brightness both remain optimized.

In addition, vertical position of the image can be manually offset-that is, moved up or down-by turning the top screw on the front of the projector (the bottom screw if the projector is ceiling mounted). The range of adjustment is roughly 130%, depending on the specific lens you are using and whether or not you are also offsetting horizontally. See Table 2.1 for the percentage of the image that can be displayed above and below the center of each type of lens designed for this projector. These image offsets are also illustrated in Figure 2.6 (fixed lenses) and Figure 2.7.

Table 2. . Maximum % of Image Offset from Lens Center

Lens Type	*Max. Recommended Image Offset*	
** 0.8:1*	⇧*105%*	⇩*100%*
1.2:1	⇧*126%*	⇩*133%*
1.5 - 2.2:1	⇧*129%*	⇩*117%*
2.2 - 4:1	⇧*129%*	⇩*117%*
4-7:1	⇧*137%*	⇩*126%*

* *NOTE: This lens is the same as the VX 3 0.8÷1 lens*

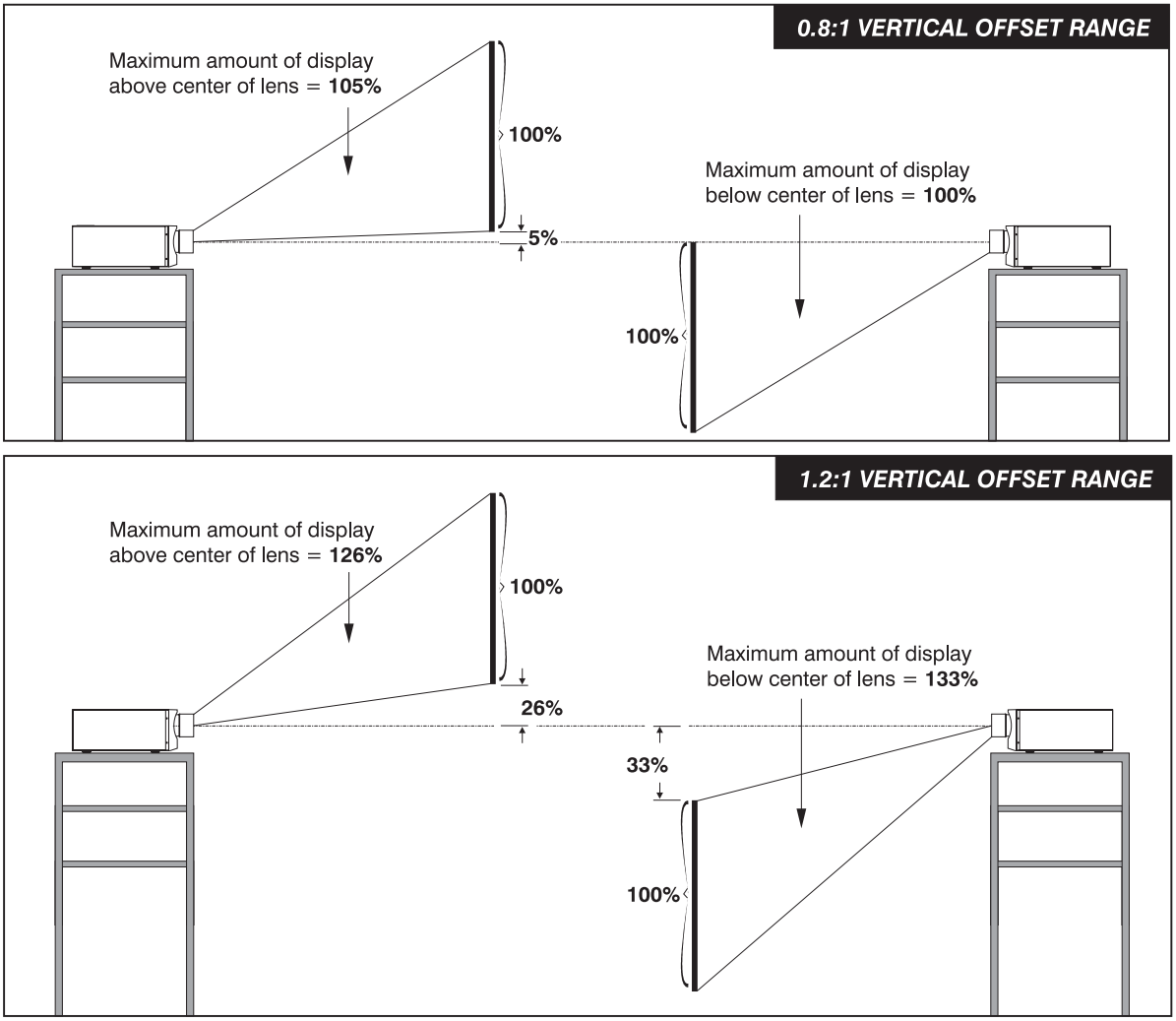

0.8:1 VERTICAL OFFSET RANGE
Maximum amount of display above center of lens = 105%
100%
5%
Maximum amount of display below center of lens = 100%
100%
1.2:1 VERTICAL OFFSET RANGE
Maximum amount of display above center of lens = 126%
100%
26%
Maximum amount of display below center of lens = 133%
33%
100%

Figure 2.6. Maximum Vertical Offsets (FIXED LENSES)

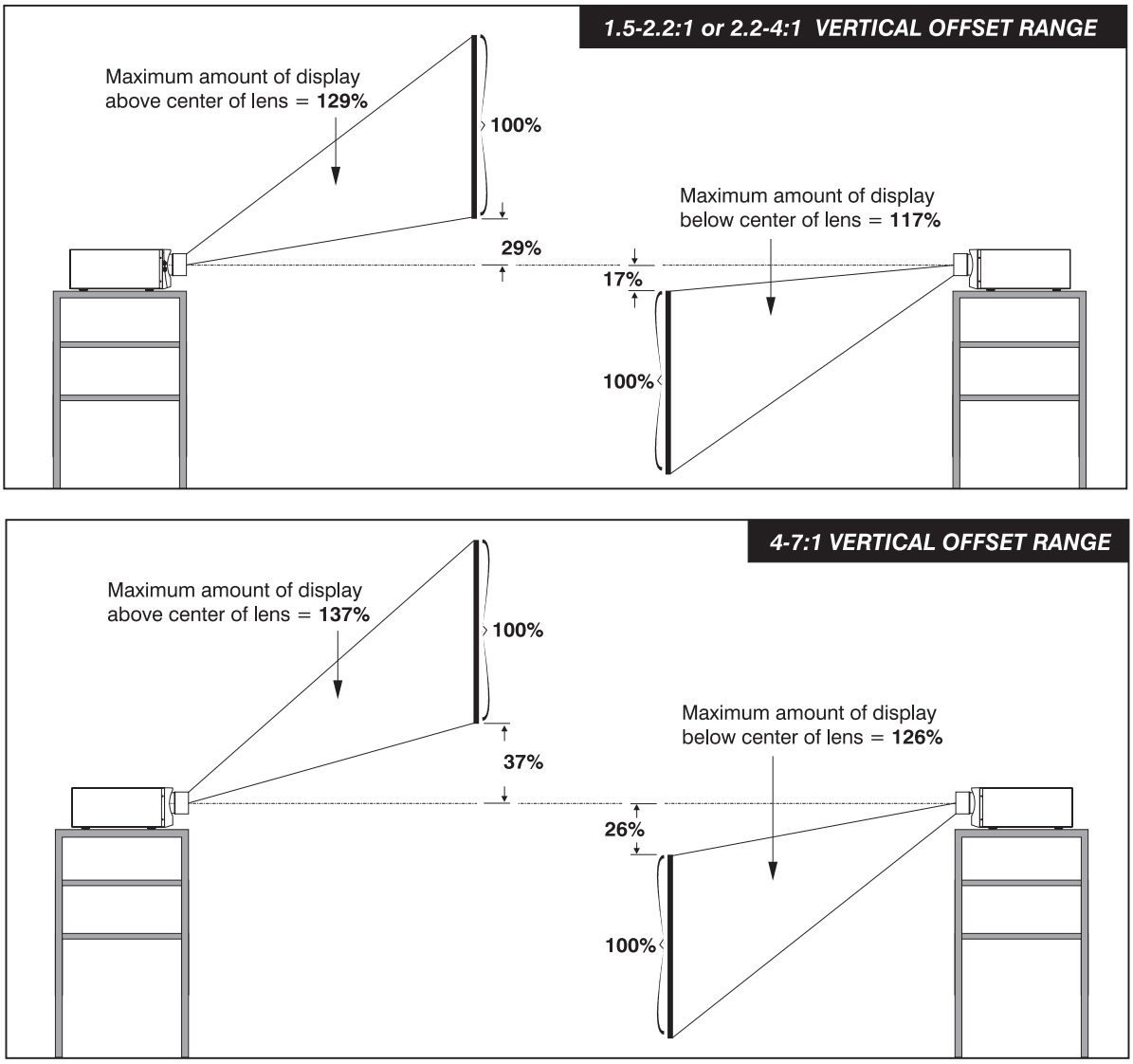

1.5-2.2:1 or 2.2-4:1 VERTICAL OFFSET RANGE
Maximum amount of display above center of lens = 129%
100%
29%
Maximum amount of display below center of lens = 117%
17%
100%
4-7:1 VERTICAL OFFSET RANGE
Maximum amount of display above center of lens = 137%
100%
37%
Maximum amount of display below center of lens = 126%
26%
100%

Figure 2.7. Maximum Vertical Offsets (ZOOM LENSES)

NOTES: ***1)*** *If you cannot raise or lower the image enough using mechanical vertical offsets, try adjusting* ***V-Position*** *in the* ***Size and Position*** *menu (see* ***3.6, Adjusting the Image****).* ***2)*** *If the image becomes keystoned or exhibits uneven brightness, the projector may simply be too high or low in relation to the screen.* ***3)*** *Recommended offset ranges can be exceeded, however this may affect image quality.* ***4)*** *Simultaneous horizontal and vertical offset limits the adjustment range of each.*

NOTES FOR ALL LENSES:
Maximum optical performance is produced at zero offset (i.e., with the projector at the center of the screen) — geometry, focus and light output will all be optimized.

Offset ranges are reduced when offsetting in both horizontal and vertical directions simultaneously.

For inverted projectors, invert the Vertical Offset illustrations.

THE HORIZONTAL POSITION of the image can be offset-that is, shifted left or right of lens center-by turning the bottom screw on the front of the projector (the top screw if the projector is ceiling mounted). The maximum horizontal offsets for the lenses designed for this projector is shown in Figure 2.8. For this projector, this value expresses the maximum percentage of the image that can be projected to one side of the lens center (roughly 80%, depending on the lens).

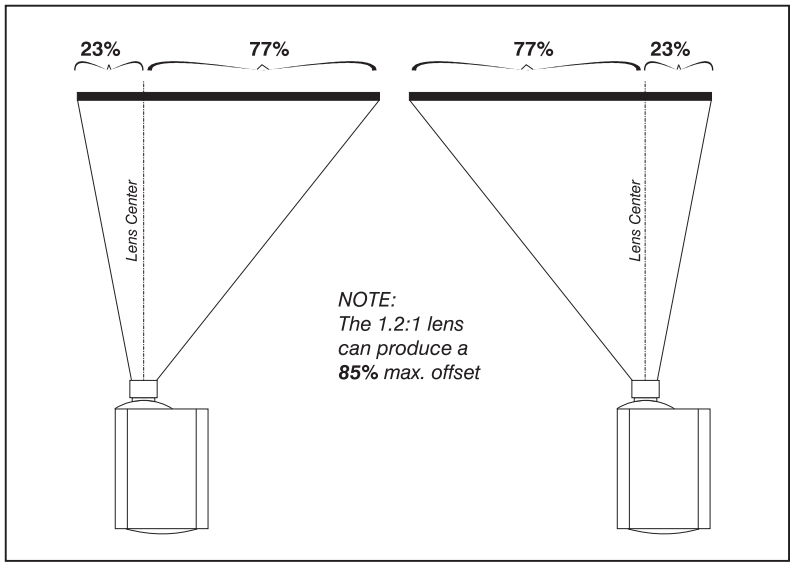


Fig 2.8. Maximum Horizontal Offset (ALL LENSES)

Mounting ⏩

For typical front or rear floor mounts, mount the projector on a secure table or cart. Take care with a mobile cart-avoid sudden stops, excessive force and uneven surfaces that may cause the projector and cart combination to overturn.

The table or cart should be reasonably level. Fine adjustments to the projector level can be made by adjusting the height of the projector legs; refer to *2.7, Leveling* for details.

Special Mounting

Note that projector can be rotated and mounted at any vertical angle-i.e., you can tilt the face of the projector up or down as much as desired for your installation. The side-to-side tilt, however, must not exceed 15° (see Figure 2.9). This limit ensures that the arc lamp in the projector operates properly and safely. Always make sure that exhaust air from the projector does not vent towards the lens, otherwise you may detect heat waves in your projected image.

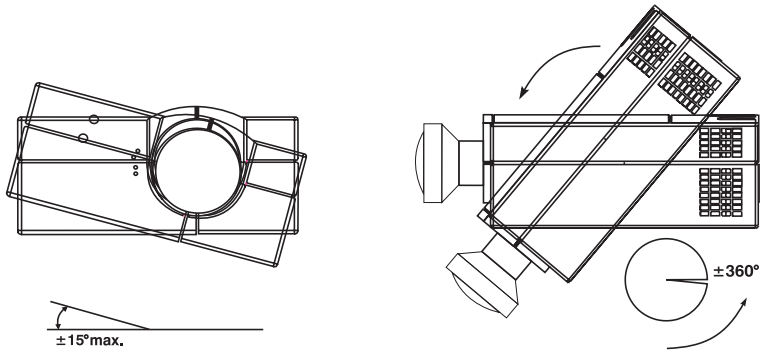
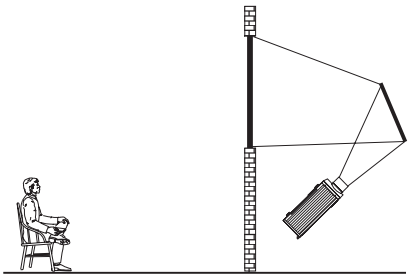


Figure 2.9. Horizontal and Vertical Tilt Ranges

You must use the proper ceiling mount fixture or stacking kit for your projector. For more information, contact your Runco dealer.

Folded Optics ⏩

In rear screen applications where space behind the projector is limited, a mirror may be used to fold the optical path. The position of the projector and mirror must be accurately set-if considering this type of installation, call your Runco dealer for assistance.



2.4 Source Connections

The rear panel of the projector provides standard input panels to which you may connect a variety of sources. See Figure 2.10-the lower left area (**INPUT 1**) typically accepts an *RGB signal* from an external RGB source (such as the VHD Ultra Controller), or it can also be used for YPbPr signals from DTV sources. The upper right panel-the *Video Decoder Module*-accepts only composite video at **INPUT 3** or *S-video* at **INPUT 4** from devices such as VCRs, laser disc players or DVD players. There are also several optional interfaces available for connecting other sources at **INPUT 2**. Such an option installs in the upper left area, just below the audio connectors. For any input, including the optional inputs, audio with loop through connects at the audio input panel located between the license label area and **INPUT 2**.

Note: The decoder module is an option; it is not supplied with the Projector.

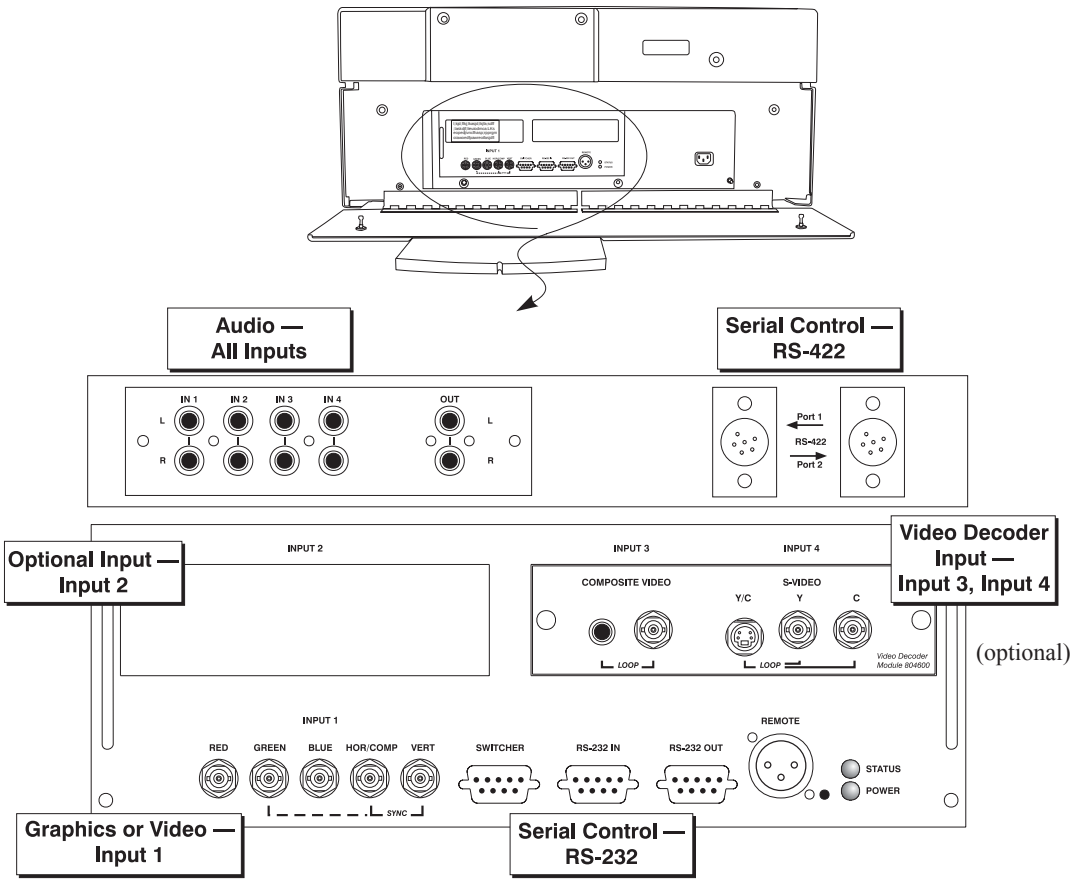


Figure 2.10. Rear Connector Panel

RGB Signals ⏩

INPUT 1 provides 5 BNCs (connectors) for linking to a variety of sources. The typical connection would be to an RGB source such as the VHD Ultra Controller, computers or DTV decoders with an RGB output. This projector supports multiple sync types with RGB signals: sync-on-green, composite sync, and separate H & V syncs.

NOTES: Depending on the source, you may need a custom adapter cable that has BNC connectors at the projector end and a different type of connector at the other (such as a 15-pin "D" connector for computer sources). Contact your Runco dealer.

Connect the **SYNC** BNC input(s) first. Then connect the red, green and blue source outputs to the **RED**, **GREEN**, and **BLUE** BNCs on the **INPUT 1** panel. If the source uses sync-on-green, only the red, green, and blue connections are required. If the source provides a composite sync output, connect it to the **SYNC** input labeled **HOR/COMP**. If the source provides separate horizontal and vertical sync outputs, connect horizontal sync to the **SYNC** input labeled **HOR/COMP** and connect vertical sync to **SYNC** input labeled **VERT**. See Figure 2.11.

*NOTE: To connect YPbPr signals, such as from analog HDTV sources, to **INPUT 1**, use the red, green and blue BNCs as described in **YPbPr Signals** later in this section.*

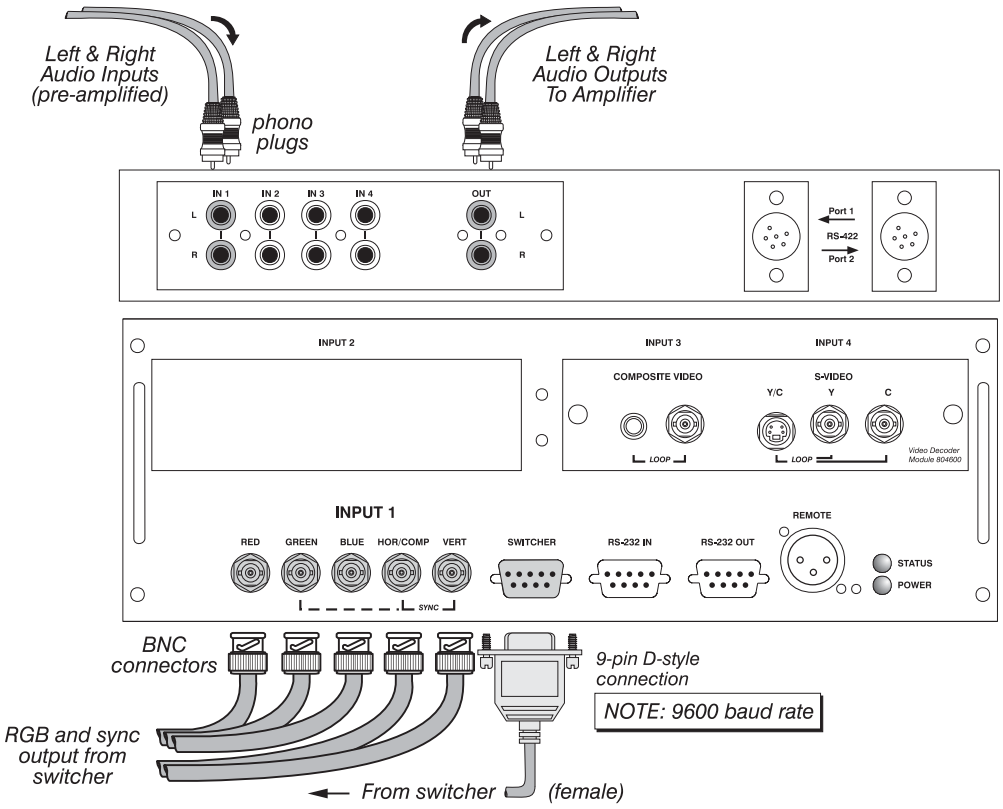


Figure 2.11. Connecting RGB Input

AUDIO for INPUT 1: To control audio levels in an audio/visual system, connect pre-amplified (line level) audio inputs to the **"IN 1"** left and right channel audio inputs located near the top left corner of the rear input panel. Then connect external audio amplification equipment to audio **"OUT"** for sound output. Audio connection cables require standard RCA type phono plugs.

YPbPr Signal (COMPONENT VIDEO) ⏩

Connect a YPbPr signal (*component video*) to **INPUT 1** as shown in Figure 2.12.

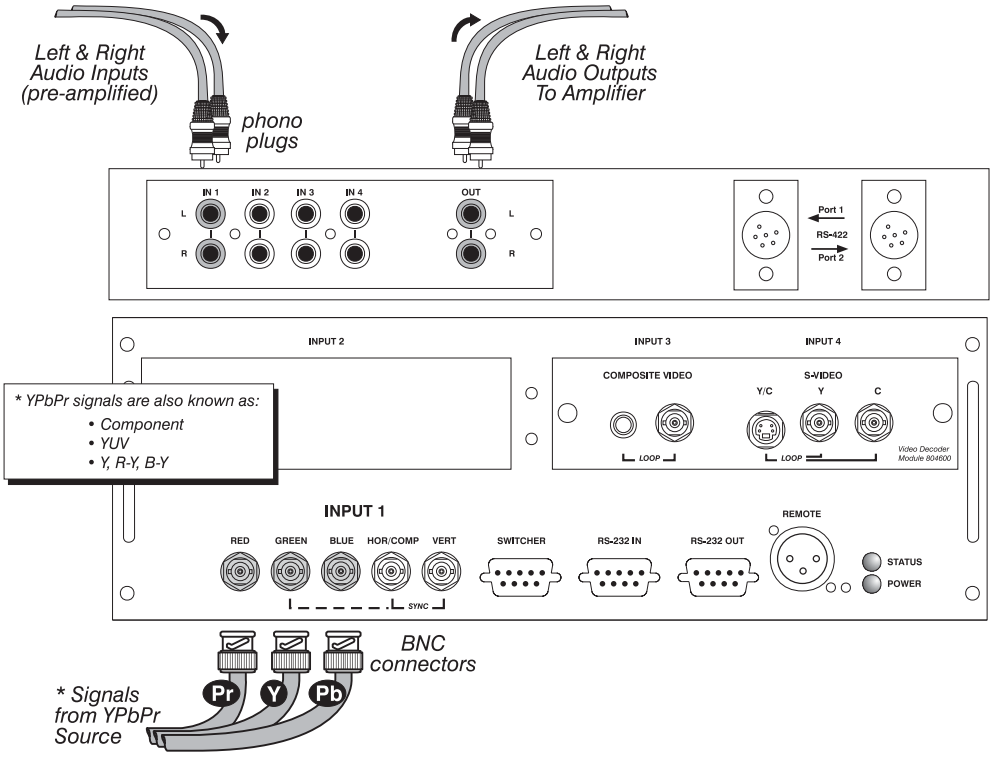


Figure 2.12. Connecting YPbPr Signal

NOTES: ***1)*** *If, for some reason, the projector fails recognize a YPbPr signal, specify this* ***Color Space*** *option within the* ***Image Settings*** *menu.* ***See 3.6, Adjusting the Image. 2)*** *Do not connect digital component signals (known as YCbCr) to* ***INPUT 1****. Use the appropriate digital interface installed at* ***INPUT 2****.*

AUDIO for INPUT 1: To control audio levels in an audio/visual system, connect pre-amplified (line level) audio inputs to the **"IN 1"** left and right channel audio inputs located near the top left corner of the rear input panel. Then connect external audio amplification equipment to audio **"OUT"** for sound output. Audio connection cables require standard RCA type phono plugs.

Composite Video ⏩

The video decoder input panel provides simultaneous connection of both a composite video source **(INPUT 3)** and an S-Video source **(INPUT 4)**.

If connecting a composite video source, use the Composite BNC connector *or* the RCA phono jack at -do not use both as inputs. See Figure 2.13.

AUDIO for INPUT 3: To control audio levels in an audio/visual system, connect pre-amplified (line level) audio inputs to the **"IN 3"** left and right channel audio inputs located near the top left corner of the rear input panel. Then connect external audio amplification equipment to audio **"OUT"** for sound output. Audio connection cables require standard RCA type phono plugs.

NOTE: If you want to loop a composite video signal through to another projector or display device, see ***Video Loop Through*** *later in this section.*

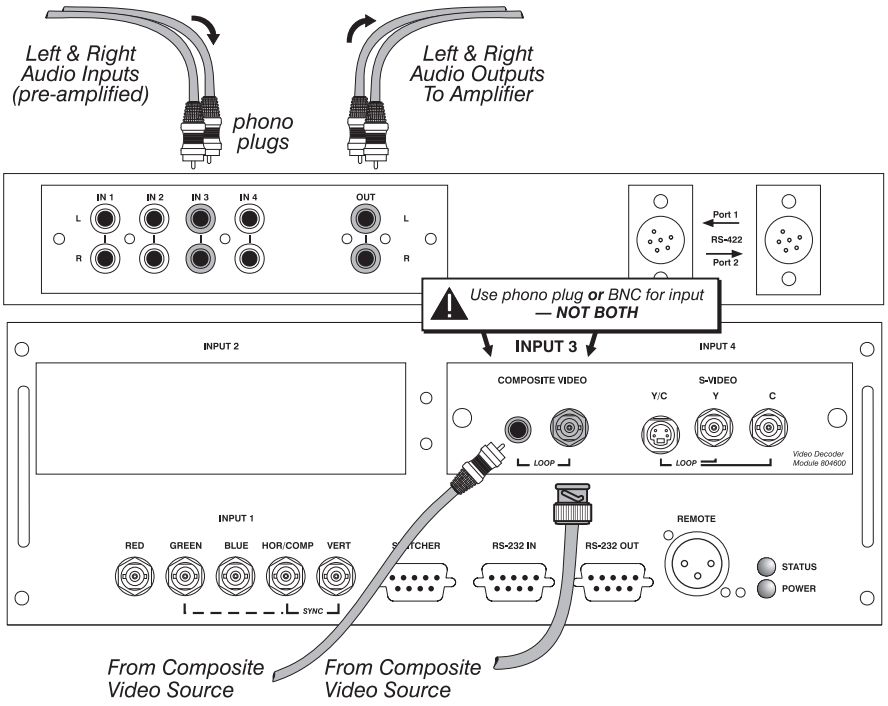


Figure 2.13. Connecting Composite Video

S-Video ⏩

The video decoder input panel provides simultaneous connection of both a composite video source (**INPUT 3**) and an S-Video source (**INPUT 4**).

If connecting an S-Video source, use the 4-pin mini DIN connector ***or*** the Y and C BNC connectors (luma and chroma) at **INPUT 4**-do not use both as inputs. See Figure 2.14.

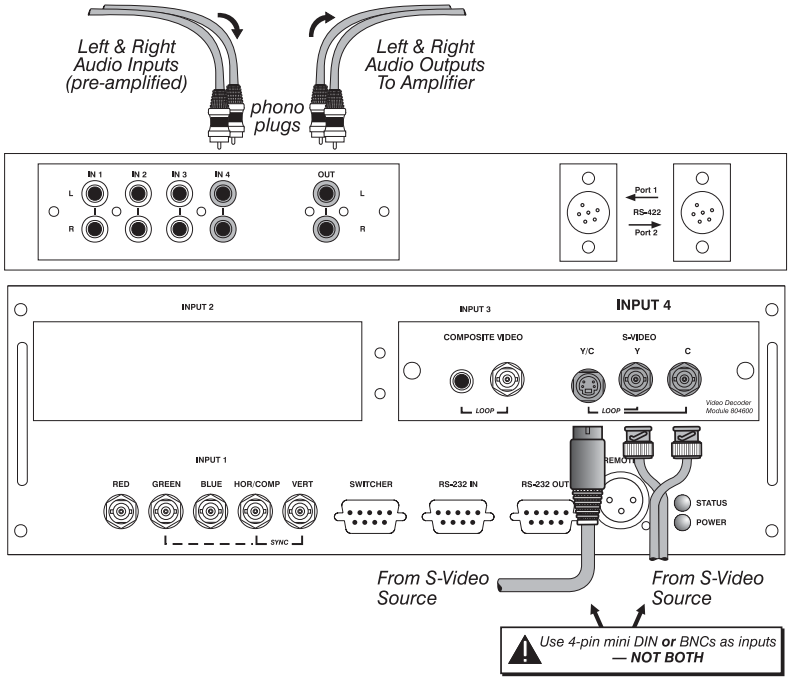


Figure 2.14. Connecting S-Video

AUDIO for INPUT 4: To control audio levels in an audio/visual system, connect pre-amplified (line level) audio inputs to the **"IN 4"** left and right channel audio inputs located near the top left corner of the rear input panel. Then connect external audio amplification equipment to audio **"OUT"** for sound output. Audio connection cables require standard RCA type phono plugs.

NOTE: If you want to loop an S-video signal through to another projector or display device, see ***Video Loop Through****.*

Video Loop Through ⏩

To loop a single incoming video signal input (connected at the video decoder) through to another projector or display device, use the empty connector(s) adjacent to this same input as described below.

Composite Video Loop Through

CONNECTIONS: See Figure 2.15. From your source, connect a composite video signal to **INPUT 3** using either the small phono plug or the adjacent BNC. Connect a second cable from whichever **INPUT 3** connector is free to one of the composite video inputs of the next display device or projector. Continue this looping method for each projector, using either the phono plug or the adjacent BNC as input into **INPUT 3**, then using the other connector as an output (i.e., loop through). Whether you use the BNC or the phono plug as input or output depends on the type of cable you have on hand and what type of connectors are on each end. If desired, connect one audio signal to any projector as usual.

VIDEO TERMINATION: In the *Preferences* menu, make sure "Video Termination" is checked for the final projector ***only***. All other projectors must have this option unchecked in order for the signal to continue. For other types of display devices in the chain, typically a "Hi-Z" switch position is needed.

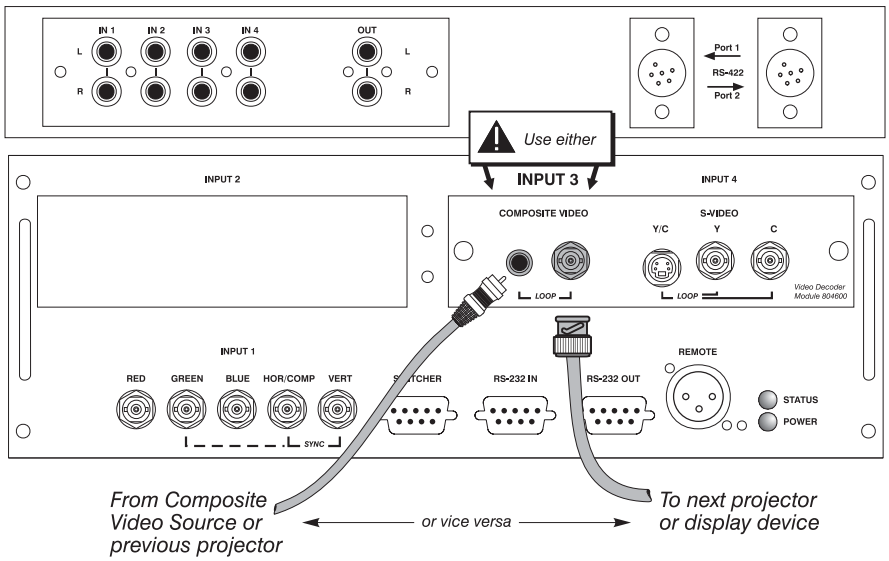


Figure 2.15. Connections for Composite Video Loop Through

S-Video Loop Through

CONNECTIONS: See Figure 2.16. From your source, connect an S-video source signal to **INPUT 4** using either the 4-pin mini DIN or the 2 adjacent BNCs labeled Y and C. Connect a second cable from whichever **INPUT 4** connector is free to one of the S-video inputs of the next display device or projector. Continue this looping method for each projector, using either 4-pin mini DIN or the 2 adjacent BNCs as input into **INPUT 4**, then using the other connector(s) as an output (i.e., loop through). Whether you use 4-pin mini DIN or the 2 adjacent BNCs as input or output depends on the type of cable you have on hand and what type of connectors are on each end. If desired, connect one audio signal to any projector as usual.

VIDEO TERMINATION: In the *Preferences* menu, make sure "Video Termination" is checked for ***only*** the final projector. All other projectors must have this option unchecked in order for the signal to continue. For other types of display devices in the chain, typically a "Hi-Z" switch position is needed.

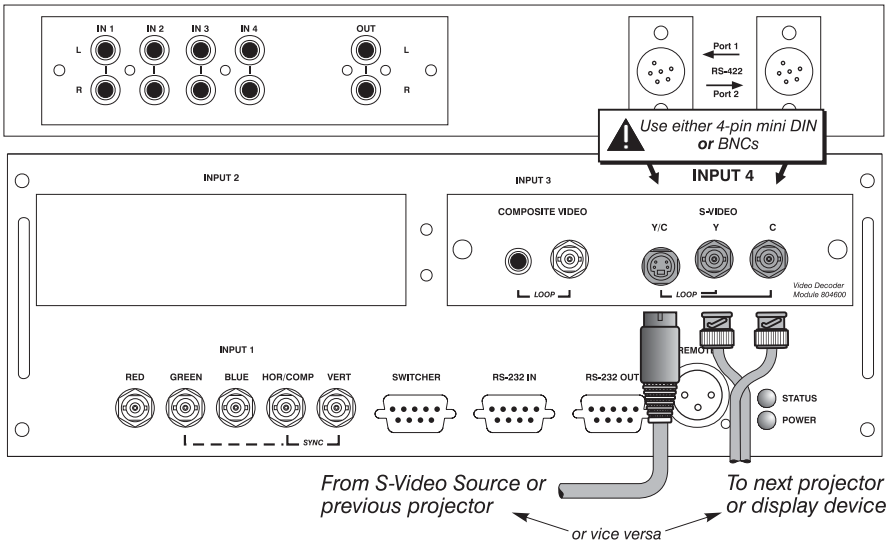


Figure 2.16. Connections for S-Video Loop Through

Extra Video- COMPOSITE OR S-VIDEO ⏩

If you want to use an extra video source in addition to the video source(s) connected at **INPUT 3** or **INPUT 4** connect either a Composite or S-Video source to **INPUT 1** as shown in Figure 2.17. Do not connect both types here simultaneously.

*NOTE: For additional video inputs, install an optional Composite/S-Video Input Module at **INPUT 2.***

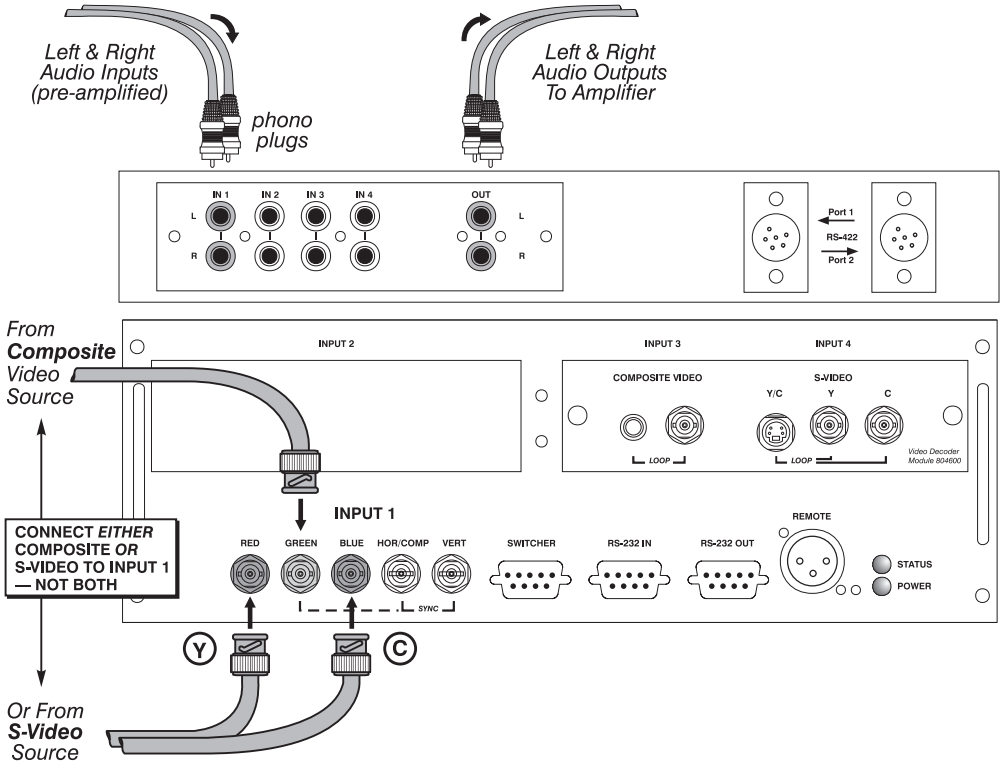


Figure 2.17. Connecting an Extra Video Source to Input 1

Optional Inputs ⏩

Optional modules from Runco allow you to increase your total number of inputs and/or accommodate different signal types, whether analog or digital. Any one of these modules can be installed in the area labeled **INPUT** 2. They include:

- RGB Input Module
- RGB Active Loop Thru Input Module
- RGB Buffered Amplifier Input Module
- Composite/S-Video Input Module
- PC250 Analog Input Module
- Serial Digital Input Module
- HDTV Serial Input Module (available Spring 2000)

2.5 Power Connection

Plug the projector's high-current 13-amp rated line cord into the line input socket located in the lower right corner of the rear panel of the projector, then plug the 3-pronged end of the line cord into a grounded AC outlet. Input voltage to the projector must be capable of supplying between 100 and 240 VAC, 50 or 60 Hz. The power source must be capable of supplying 1200 watts of power to the projector. See Section 5, Specifications for all power requirements.

⚠WARNING⚠

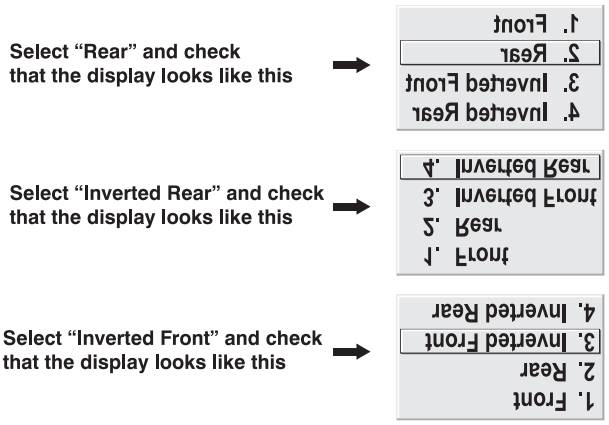
Do not attempt operation if the AC supply and cord are not within the specified voltage and power range.

⚠ ***Caution:*** *Once the projector is turned off, the lamp cooling fans will continue to run for approximately five minutes to ensure that the projector and lamp have sufficiently cooled, at which point the fans will automatically shut off. To avoid thermal stress to the lamp, never unplug the line cord while the lamp cooling fans are running. Do not unplug the projector in order to power down.*

2.6 Operating Orientation

The projector is set up at the factory for use in a front screen, floor mount orientation. If your initial installation is ceiling mount or rear screen, displayed images may be upside down and/or reversed. To correct, you must change the image orientation from within the *Preferences* menu (you may prefer to do this before physically installing the projector in its final position/orientation).

In the Preferences menu, highlight and select the "Image Orientation" pull-down list. Select from Rear, Inverted Rear, Front or Inverted Front according to your intended installation. See *Section 3, Operation* for further information.


Select "Rear" and check that the display looks like this
1. Front
2. Rear
3. Inverted Front
4. Inverted Rear
Select "Inverted Rear" and check that the display looks like this
1. Front
2. Rear
3. Inverted Front
4. Inverted Rear
Select "Inverted Front" and check that the display looks like this
1. Front
2. Rear
3. Inverted Front
4. Inverted Rear

2.7 Leveling

For most installations, the lens surface of the projector is parallel to the screen-this prevents 'keystoning' of the image (i.e., an image with non-parallel sides). In addition, the projector must be kept level from side-to-side in order for the lamp to function safely. To make small corrections to the projector's level, rotate each leg as necessary to raise or lower. For angled installations, see *"Special Mounting"* under *2.3, Projector Position and Mounting* earlier in this section.

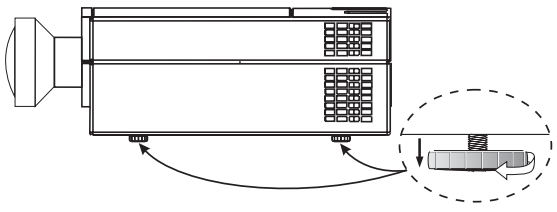


Figure 2.18. Adjusting the Feet Height

2.8 Zoom, Focus & Lens Offset

Once the projector is properly set up and producing an image, you are ready to make quick lens adjustments.

Zoom ⏩

If you have a zoom lens installed, turn the textured ring of the lens barrel to decrease or increase the size of the image at the current throw distance. *NOTE: Do not touch the lens surface.*

Focus ⏩

At the lens opening, turn the focus tab until the image is as sharp as possible.

Lens Offset ⏩

To ensure that the image is located as desired, turn either or both of the front screws next to the lens. The top screw (vertical) will raise or lower the image, the bottom screw (horizontal) will shift the image left or right. Try to achieve the desired overall image position and best brightness while obtaining a rectangular image. If the brightness looks uneven, or the edges do not look perfectly straight, the projector may not be in the optimal position for your screen. See *2.3, Projector Position and Mounting* for full details. Lens offset ranges are also listed on page 5-1.

Further display adjustments are available through keypad commands and on-screen menus-refer to *Section 3, Operation*.

2.9 Serial Port Connections

You may wish to use equipment other than the keypad for controlling the projector or for performing other special functions. Such equipment-such as most personal computers-requires a serial interface for sending and receiving communications through the serial ports on the projector. Note that there are two different types of serial communication ports on this projector as described below.

If using a computer ⏩

RS-232 Ports

From computers or automation systems, connect an **RS-232** serial communication cable between the controlling device and the projector serial port labeled **RS-232 IN**-this 9-pin D connector port is located near the bottom center of the projector's rear control panel (see Figure 2.19). Then set the projector baud rate to match that of the computer or automation system(changing the baud rate is described in *3.7, Adjusting System Parameters and Advanced Controls*).

*NOTE: Refer to **Appendix D** for complete cable wiring details.*

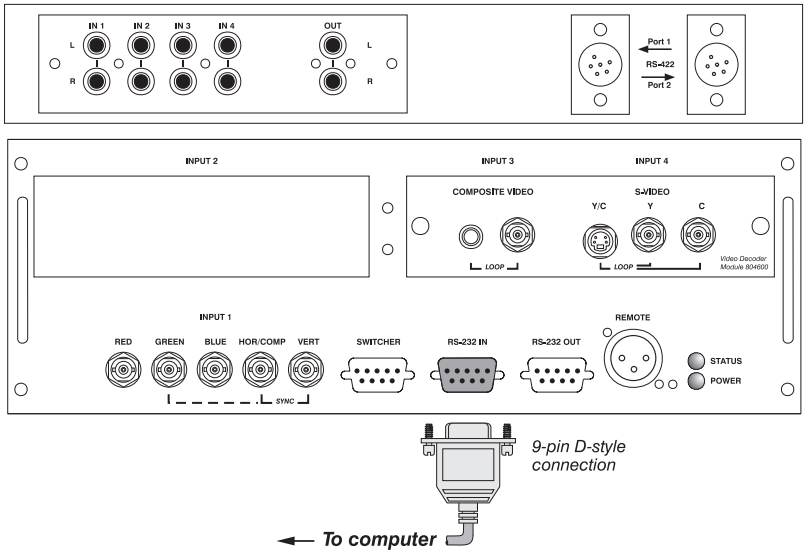


Figure 2.19. RS-232 Serial Connection to a Computer

RS-422 Ports

Some systems can provide **RS-422** serial communications (often through a plug-in adapter or external converter) rather than the more common RS-232. RS-422 communication has differential "transmits-and-receives" and is generally better suited for long distances than is RS-232 communication. RS-422 is not compatible with RS-232-connecting one to the other could damage the equipment at either end.

If you wish to control the projector with a computer and/or other controlling device having RS-422 capability, connect **RS-422** serial communication cables between the computer (or other device) and either (or both) of the projector serial ports labeled **RS-422**-these 6-pin XLR connector ports are located near the upper right corner of the projector's rear control panel (see Figure 2.20). Use an **RS-422** port ***only*** if your equipment has RS-422 capability-always first consult the documentation supplied with your equipment.

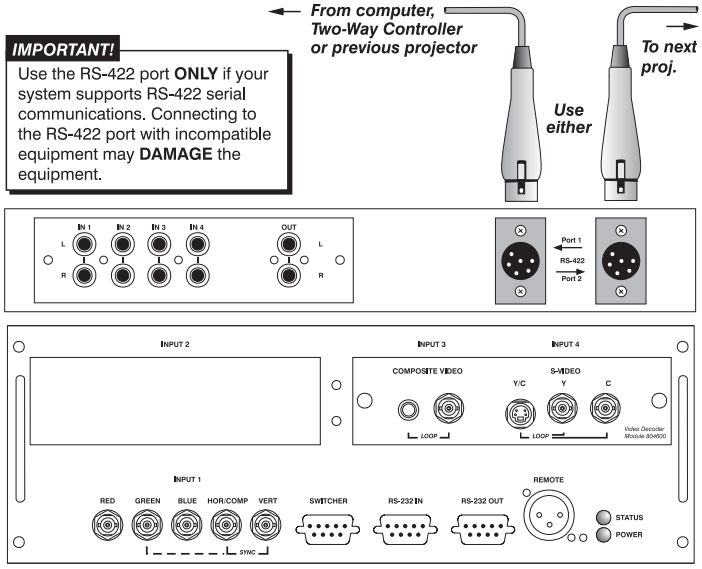


Figure 2.20. RS-422 Serial Connection to a Computer

⚠ WARNING ⚠

Do not use an RS-422 port unless you are using a computer with RS-422 capability. The voltage levels of this signal can damage incompatible equipment.

If using multiple projectors ⏩

Serial Communications

RS-232 NETWORK: To control multiple projectors with a computer/controller having an RS-232 interface, chain the projectors together by connecting the **RS-232 OUT** connector of the first projector (already connected to the computer/controller) to the **RS-232 IN** connector of the next projector in the chain.

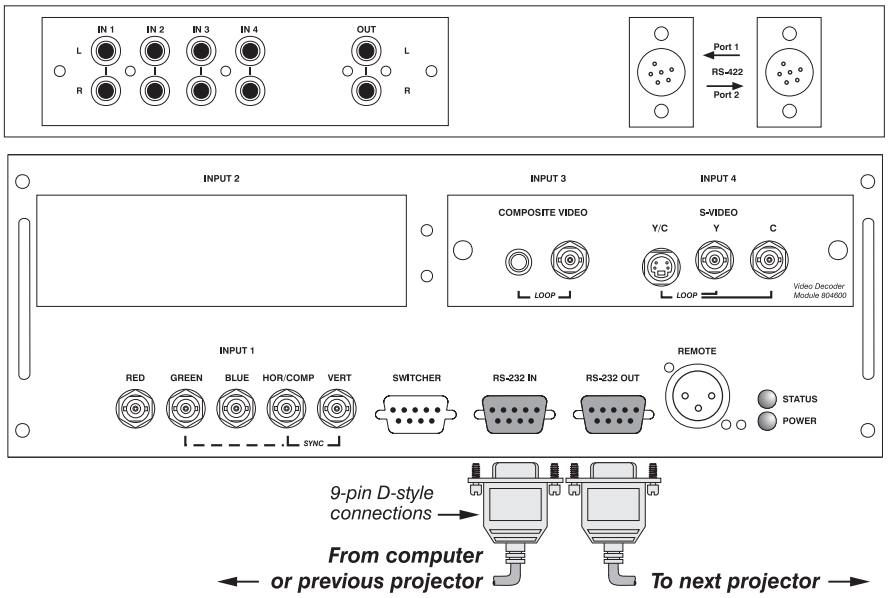


Figure 2.21. Adding Another Projector via RS-232

RS-422 NETWORK: To control multiple projectors with a computer/controller having an RS-422 interface, you can chain the projectors together by connecting the **RS-422 PORT 2** connector of the first projector (already connected to the computer/controller) to the **RS-422 PORT 1** connector of the next projector in the chain.

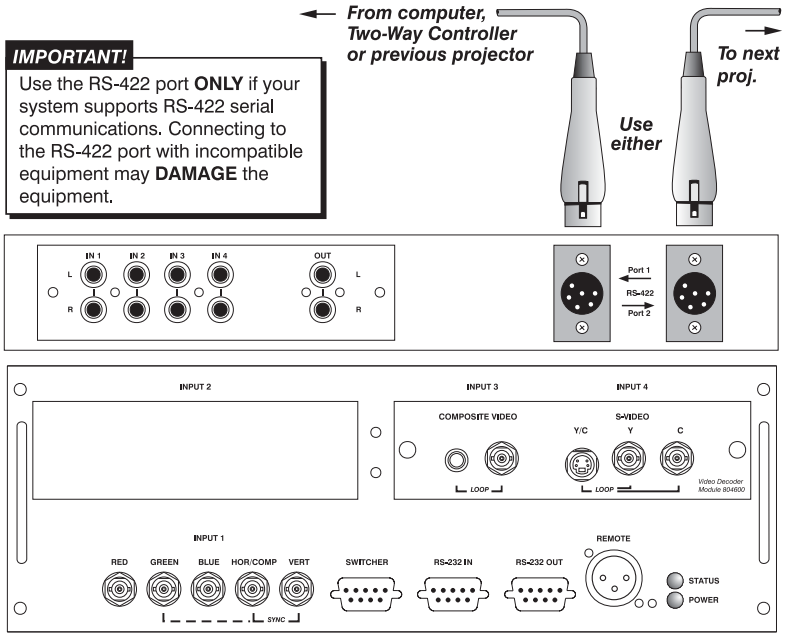


Figure 2.22. Adding Another Projector via RS-422

For either type of network, continue connecting projectors in this manner until you've reached the last projector in the chain, so that only the last projector has an empty **RS-232 OUT** (or **RS-422 PORT**, if applicable). See examples on the following page.

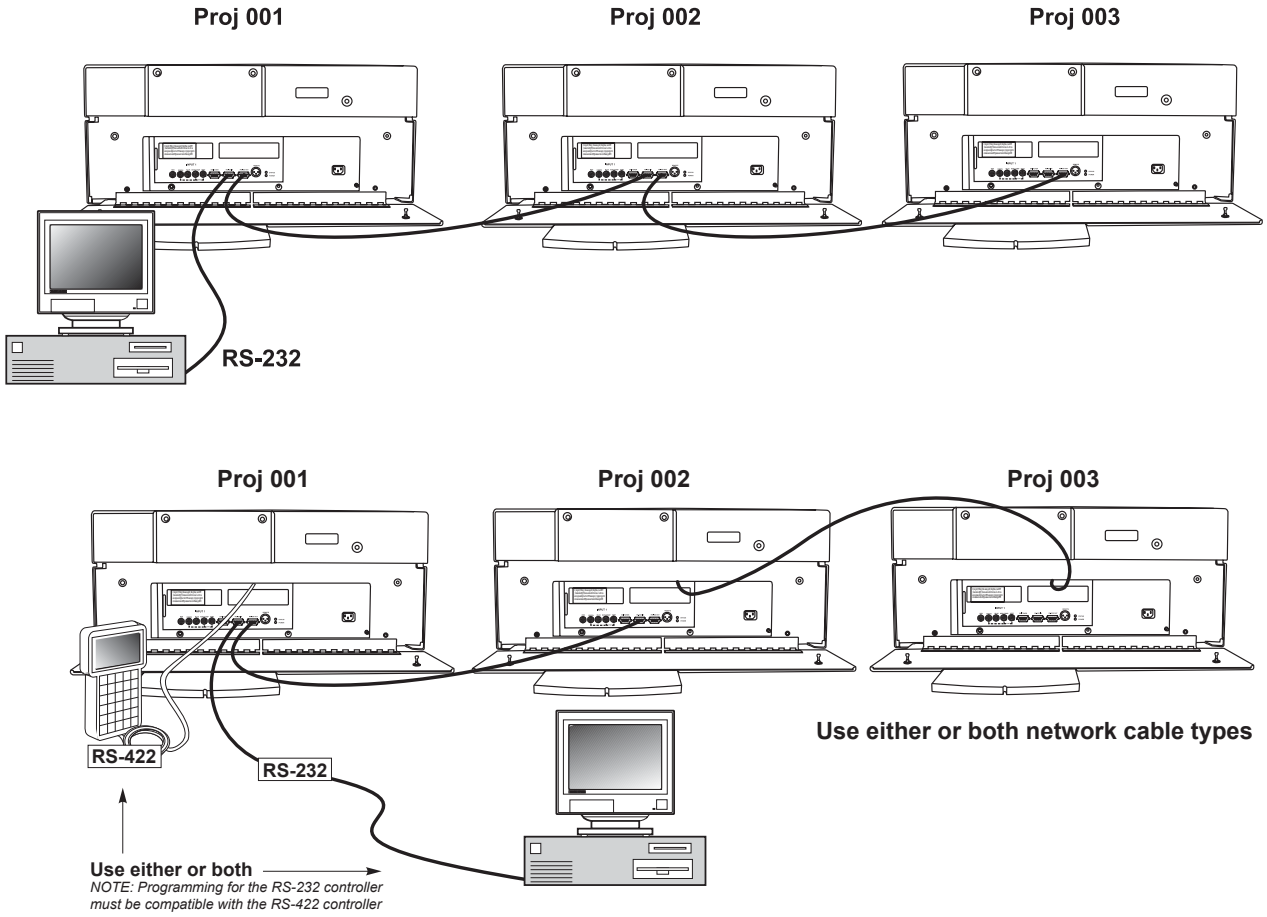


Figure 2.23. Assorted Networks

Communication parameters such as baud rate must be set to match the particular controlling device-refer to the documentation that came with your controlling device in order to determine the proper baud rate. See *3.7, Adjusting System Parameters and Advanced Controls* if you need help changing the projector baud rate from its default of 38400.

NOTES: ***1)*** *To avoid damage, connect only properly wired serial communication cables. See* ***Appendix D*** *for details.* ***2)*** *It is recommended that each RS-232 communication cable be no more than 25 feet in length. Use high quality cables.*

Projector Numbers ⏩

Each projector can be assigned a unique 3-digit projector number (for example, 001). These numbers are particularly useful when you are working with multiple linked projectors, enabling you to direct commands to a certain projector rather than always broadcasting to the entire network. For complete information on how to assign projector numbers, see *3.7, Adjusting System Parameters and Advanced Controls.*

NOTE: To loop a single incoming video source through to another projector or display device on a network, see ***Video Loop Through*** *in* ***2.4, Source Connections.***

2.10 Keypad Protocols and Conversion

At manufacture every keypad is assigned "A" as its default protocol, which is simply a collection of settings that determine how the keypad operates. Once assigned, this protocol remains in effect until it is changed-that is, the keypad will operate as it currently does until you change its protocol.

Protocols are most useful for multiple-projector applications. For example, you might want to change a keypad protocol if you are working with two projectors and two remote keypads in the same room and need to control each projector independently (Figure 2.24). When Keypad A has a different protocol than Keypad B, each keypad communicates only with the projector having a matching protocol. Or, if you have a network of two or more projectors connected together via RS-232 serial ports, you may want only certain projectors to respond to a wired keypad, thus you can use different protocols to limit responses.

NOTE: Matching the protocol on the projector to that of a keypad is done through a setting in the ***Communications*** *menu. See* ***3.7, Adjusting System Parameters and Advanced Controls*** *for further information on how to change the projector's infrared sensor (rear and front) protocol.*

A protocol for either type of remote keypad - IR or wired - can be changed through software commands entered on the keypad. A new protocol set through software commands remains in effect until the keypad batteries are removed and replaced (if an IR remote), or until the keypad is unplugged (if a wired remote). A remote can also be changed manually -you can "hard-wire" new jumper settings inside the keypad so that they remain in effect until you change the hard-wiring. Note that a hard-wired protocol can be temporarily overridden by the software protocol change, effective until the keypad is unplugged and plugged in again (if a wired remote) or until a battery is removed (if an IR remote).

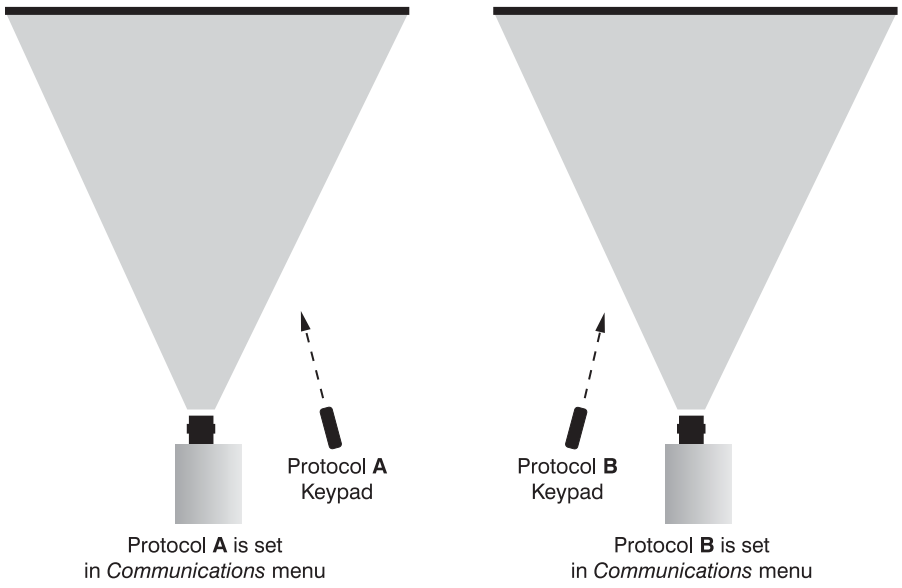


Figure 2.24. Independent Keypads and Projectors

Remote Keypad ⏩ Protocol - IR OR WIRED KEYPAD -

The standard IR remote keypad or the optional wired remote can be set to one of two different protocols - "A" or "B". To hard-wire a protocol to "A" or "B" in either remote, follow Steps 1 through 5:

Step 1

Unplug the keypad from the projector (applies to wired remote only).

Step 2

Unlatch and open the empty battery compartment on the back of the keypad as shown in Figure 2.25.

NOTE: A wired keypad opens as shown, but a cable passes through the battery compartment cover.

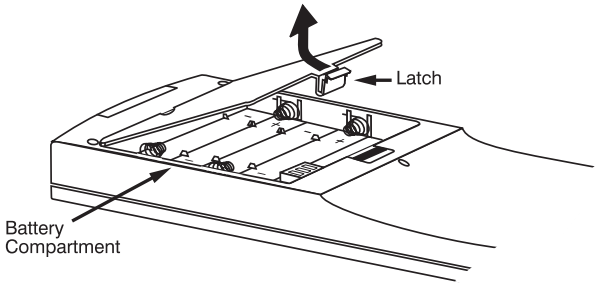


Figure 2.25. Opening the Keypad

Step 3

Find the 4 jumpers located along the latching side of the battery compartment. These jumpers set the keypad protocol and other settings so that the keypad functions in a certain manner.

Step 4: Set the Jumpers

Set the jumpers as shown in Figure 2.26. Take care to refer to the correct part of the drawing - IR or wired (optional). Use tweezers or needle-nose pliers to remove and replace each jumper as necessary.

- **J1** jumper: For either remote, set between pins 1 and 2 to set as Protocol “A”. Set between pins 2 and 3 to set as Protocol “B”.

- **J2** jumper: For either remote, set between pins 2 and 3 as shown; otherwise, the projector will not respond correctly to keypad commands.

- **J3** jumper: For the IR remote, make sure that the jumper is set between pins 2 and 3 as shown. For the wired remote, make sure that the jumper is set between pins 1 and 2 as shown.

- **J4** jumper: For the IR remote, make sure that the jumper is set between pins 1 and 2 as shown. For the wired remote, make sure that the jumper is set between pins 2 and 3 as shown.

Step 5
Replace battery compartment cover. Plug into projector (wired keypad only) and test.

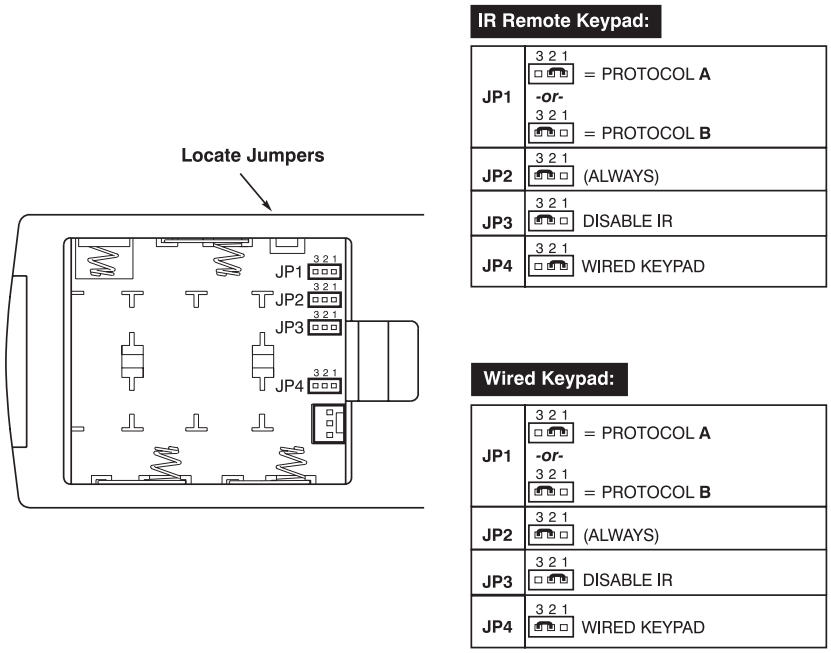


Figure 2.26. Locating and Setting the Jumpers

NOTE: A wired keypad can be converted into an IR remote keypad, and vice versa. Follow the settings shown above, adding or deleting the cable and batteries as required. The cable with 3-pin XLR connector is available separately from your dealer.

SHORTCUT METHOD:
You can also issue software protocol settings through the keypad. These software commands will be lost when the keypad is either unplugged or when a battery is removed - the keypad will revert back to the hard-wired jumper settings (see above) until you enter the software commands again.

Press Input1 Color Pixel Position 1 = Protocol “A”
Press Input1 Color Pixel Position 2 = Protocol “B”

NOTE: If you change any keypad to a new protocol and the projector stops responding, the projector may be set to a conflicting protocol. Use the projector's built-in keypad to access the Communications menu. Under "Front IR" or "Back IR" or "Wired Keypad", select the protocol that matches the new protocol of the keypad at hand. The projector should now respond properly.

Converting a Keypad ⏩

If desired, you can convert an IR remote keypad into a wired remote keypad and vice versa.

TO CHANGE FROM INFRARED TO WIRED:

- Remove battery compartment cover from back of keypad.
- Remove batteries.
- Wait 1-2 minutes.
- Plug the keypad cable (available separately) into the empty battery compartment. Make sure that the battery cover is notched smoothly to accommodate the cable.
- Set keypad protocol as desired, using "wired" jumper settings.
- Replace battery compartment cover.
- Plug into the 3-pin XLR port at the rear panel of the projector.

TO CHANGE FROM WIRED TO INFRARED:

- Unplug the keypad from the projector.
- Open the keypad back and unplug the keypad cable.
- Wait 1-2 minutes.
- Install batteries (see *Section 4*).
- Set keypad protocol as desired, using "IR" jumper settings.
- Replace battery compartment cover.

OPERATION

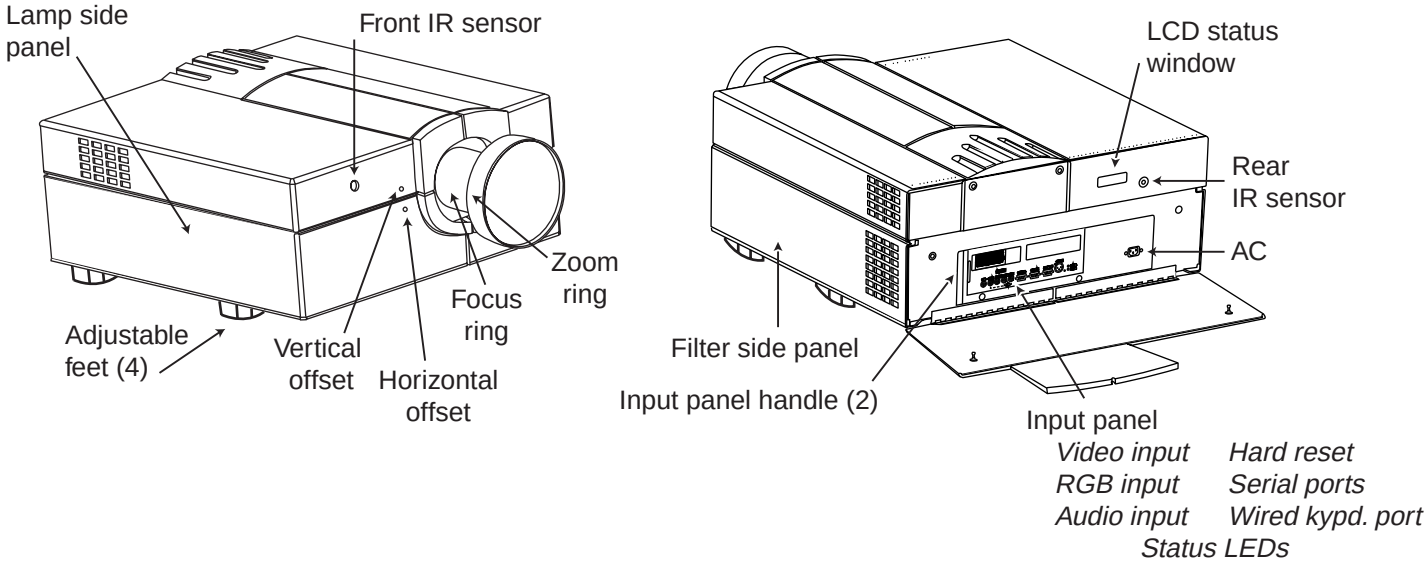
3.1 Overview

This section explains how to use the projector once it has been installed. Please read through these pages before using the projector for the first time. An understanding of projector features and how to access them will help you to take full advantage of the capabilities of the projector within minutes.

NOTE: Installation involves locating the projector and adjusting it for use at that location. If you have not yet installed the projector, refer to ***Section 2, Installation and Setup.***

3.2 Projector Basics

Most projector functions and adjustments are entered through keypad commands that either control the projector directly or activate a system of intuitive menus. Variations in settings can be defined and retained in the projector's internal memory as a custom *channel*, with up to 99 different channels possible.



OPERATION

Components / Features ⏩

ZOOM- Adjusted manually, the lens barrel of a zoom lens rotates to adjust the size of the image without moving the projector. Minimum and maximum image sizes depend on which zoom lens is installed.

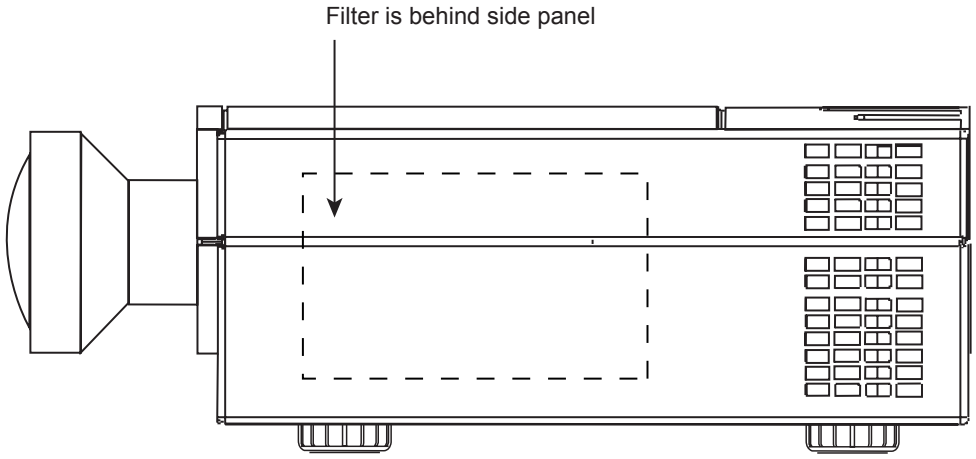
FOCUS- Adjusted manually. Focus adjusts the sharpness of the image at the current throw distance.

LENS OFFSET - Adjusted manually, vertical and horizontal offsets shift the lens and move the image up or down and left or right. Installation and Setup for the offset ranges for any given lens.1.

SHUTTER - Closing the shutter blocks the lens internally and turns the image to off. The shutter is controlled with the keypad. (OPTIONAL)

LAMP SIDE PANEL - For accessing the interior lamp door and replacing the lamp module. NOTE: Lamp replacement requires a qualified service technician.

FILTER INSIDE PANEL - Louvered grille for air intake. Remove to replace air filter.



COMPOSITE/S-VIDEO INPUT - Accepts a composite video and S-Video signal from devices such as VCRs.

RGB INPUT - Accepts RGB and sync signals from devices such as the VHD Ultra Controller or a computer, as well as YPbPr component signals from a DTV decoder.

RS-232 SERIAL INTERFACE (WITH LOOP THROUGH) - Allows one or more projectors to be remotely controlled by a computer or controller.

RS-422 SERIAL INTERFACE (WITH LOOP THROUGH) - Allows one or more projectors to be remotely controlled by an RS-422 compatible computer or controller. RS-422 communications can travel greater distances than can RS-232 communications, but require RS-422 compatible equipment.

AC LINE CORD INPUT - The projector requires AC power of 100 to 240 VAC, 50 to 60 Hz (11.5 amps @ 100 VAC, 5.5 amps @ 220 VAC). Always use the line cord that is supplied with the projector-the projector requires this high-current 13A rated cord. See complete power specifications in Section 5.

WARNING

Do not attempt operation if the AC supply is not within the specified voltage and power range.

STATUS/POWER LEDS - Two LEDs (light emitting diodes) located in the lower right corner of the rear connector panel indicate projector "Status" (top) and "Power" (bottom). During normal operation, the "Power" light is steady green and the "Status" light flashes green each time a key is pressed or when the projector receives a serial command. Use the following as a guide:

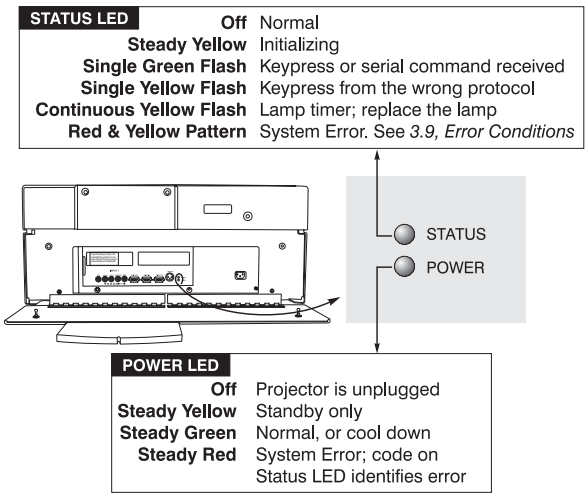

STATUS LED
Off Normal
Steady Yellow Initializing
Single Green Flash Keypress or serial command received
Single Yellow Flash Keypress from the wrong protocol
Continuous Yellow Flash Lamp timer; replace the lamp
Red & Yellow Pattern System Error. See 3.9, Error Conditions
STATUS
POWER
POWER LED
Off Projector is unplugged
Steady Yellow Standby only
Steady Green Normal, or cool down
Steady Red System Error; code on Status LED identifies error

Figure 3.2. Reading the Status LEDs

NOTE: A steady red power light accompanied by a coded pattern of red and yellow flashes from the status light indicates an internal system error. Consult the rear LCD display for an explanation, and see ***3.9, Error Conditions.*** *Should the problem persist, contact your Runco dealer.*

REMOTE WIRED KEYPAD CONNECTOR (3-pin XLR) - For optional tethered remote control of the projector.

LCD STATUS DISPLAY - Visual feedback for monitoring projector activities and status.

INFRARED SENSORS - The infrared (IR) sensors on the front and rear of the projector receive infrared signals from the IR keypad for remote control of projector functions. For proper operation make sure that these sensors are not blocked.

HARD RESET - Emergency access for powering down the projector in the event of a system failure. Insert a pen point or small screwdriver.

OPERATION

3.3 Using the Keypad The keypad appears in two locations:

- ***Infrared (IR) Remote*** for wireless control up to 100 feet away
- ***Wired Remote*** (optional) tethered to the rear of the projector

While each keypad is identical in layout and provides complete control of the projector, you may find one keypad more convenient than another for your specific installation and application.

IR Remote

The IR Remote Keypad controls the projector by way of wireless communications from a battery-powered infrared (IR) transmitter. Use the IR remote keypad the same way you would use a remote keypad supplied with a TV or VCR. When making key presses, point the keypad either toward the screen or toward the front or rear of the projector. One of two sensors on the projector will detect the signals and relay the commands for internal processing.

Wired Remote-OPTIONAL-

The wired remote keypad connects to the 3-pin XLR jack via a 50 ft. cable. It is recommended when:

- the lighting conditions are unsuitable for proper IR transmission
- you want to use a separate keypad for each projector in a group

Guide to Keypads

Keep in mind the following guidelines:

1) Press keys one-at-a-time; there are no simultaneous key presses required.

2) For any key having an "*"(Power* for example), hold the key for approximately 1 second in order to toggle the function with a single key press. For other keys (or to use a "*" key in conjunction with ▲ON or ▼OFF), a momentary press similar to a mouse click is sufficient.

3) Press the "lightbulb key" to temporarily illuminate the backlight for the keys without sending any other command.

4) ◄ − , + ► , ▲ON , and ▼OFF repeat their "arrow" actions when held down. For other keys, release and press again to repeat an action.

5) If you press a key while the projector is busy with another action, such as during a power-up, the key press may not take effect.

Keypad Commands

Specific keypad commands are explained below:

Power* **Power ON/OFF**

Press and hold for approximately 1 second to turn the projector on or off with a single key press. Or press Power* followed immediately by ▲ON or ▼OFF if you want to guarantee the correct toggle (useful if you are unsure of the present status).

NOTES: 1) Whenever the projector is turned off, the lamp cooling fans remain on for about five minutes to cool the lamp. 2) It is a good idea to avoid turning a projector back on until it has been off for a few minutes. Hot re-strikes of the lamp may reduce lamp life.

Input1 **Input 1**

Press Input1 to select the source connected to INPUT 1 on the projector (data input). This is the same as entering.

Input2 **Input 2**

Press Input2 to select the source connected to **INPUT 2** on the projector (an optional interface). This is the same as entering Input 0 2.

Input3 **Input 3**

Press Input3 to select the source connected to **INPUT 3** on the projector (composite video). This is the same as entering Input 0 3.

Input4 **Input 4**

Press Input4 to select the source connected to **INPUT 4** on the projector (S-Video). This is the same as entering Input 0 4

Input **Input**

Press Input *n* *n* when you want to display from a specific source location, such as a switcher connected serially to the projector's switcher port. The first digit represents the number you have assigned to your switcher (usually 1-9, or "0" for one of the four inputs on the projector). The second digit represents the switcher's slot number (1-9). For example:

Input 1 2 = display data from switcher 1, slot 2.

NOTES: 1) Although you don't need to use the input key, you can also use Input *to access the four input "slots" on the projector itself: use* 0 *as the first digit (representing the projector as the switcher), then* 1, 2, 3, *or* 4 *as the second digit (the desired input slot number). in combination with higher numbers is an invalid entry. 2) See* ***3.5, Using Channels and Inputs*** *for a detailed explanation of inputs.*

NOTE: Input *key behavior during a presentation depends on whether or not the* ***Display Channel List*** *option is selected in the* ***Preferences*** *menu. You can choose to have on-screen feedback when you press* Input *, or you may prefer to enter the desired source location "blind", i.e., without on-screen feedback. See* ***Preferences*** *later in this section.*

Chan **Channel**

Press Chan to select a specific source setup (channel) defined and stored in projector memory. Once you enter a 2-digit channel number (or, if there is a list displayed, highlight it and press Enter), the display will automatically change and update according to the numerous setup parameters defined for that channel.

NOTE: Chan *key behavior during a presentation depends on whether or not the* ***Display Channel List*** *option is selected in the* ***Preferences*** *menu. You can choose to use a scrollable list of channels when you press* Chan*, or you may prefer to enter the desired channel number "blind", i.e., without on-screen feedback. See* ***Preferences*** *later in this section.*

Stby* **Standby**

Press Stby* and hold for approximately 1 second to blank all display and mute the audio output while keeping the projector in a warmed-up and ready state. Or quickly press and release Stby* and follow immediately by ▲ON or ▼OFF if you want to guarantee the correct toggle (useful if you are unsure of the present status). Note that the lamp and electronics remain ON in standby mode, even though the image turns to black and most functions are disabled. To leave standby, press and

hold [Stby*] again (or use [Stby*] [▼OFF]). Or simply press [Exit] or [Menu] .

[Menu]

Menu

Press [Menu] display the Main menu. A list of several options appears for access to specific functions, such as *Channel Setup* or *Image Settings.* Press [Menu] again to remove all menus and return to the displayed source.

[Enter]

Enter

Press [Enter] select a highlighted item, to toggle a checkbox (checked vs. unchecked), or to accept a parameter adjustment and return to the previous menu or image.

[Exit]

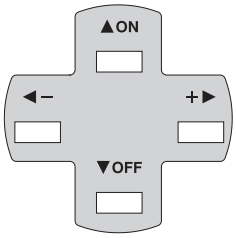
Exit

Press [Exit] return to the previous level, such as the previous menu.

NOTE: [Exit] *does* ***not*** *save changes within text editing boxes (including number editing of a slidebars) or within pull-down lists. It acts as a "cancel" in these cases.*

Arrow Keys

The arrow keys have a variety of functions depending on the situation. Some typical uses are described below. See also *Editing Text* later in Section 3.



- Use [◄–] or [+►] to change a slidebar value-hold as desired for continuous adjustment *(note the adjustment increments and range depend on the parameter being adjusted)*.
- Use [◄–] or [+►] to change to a different option within a pull-down list without having to display the list first.
- Use [◄–] or [+►] to jump between "pages", such as in *Help* or lengthy pull-down lists.

[▲ON]
Or
[▼OFF]

Use the [▲ON] or [▼OFF] keys to navigate within a menu, pull-down list or text box, or to increase decrease the value in the second (bottom) slidebar of a double slidebar.

You can also use [▲ON] or [▼OFF] in conjunction with certain *toggle* keys-i.e., those including an asterisk symbol-to ensure a toggle *only* in the desired direction. When turning the projector on, for instance, you may be too far from the projector to know whether it is really off or if the shutter is merely closed. If you press [Power*] and hold it for approximately 1 second in hopes of turning the projector *on*, the projector will actually turn *off* if the projector was already on. Instead, to avoid the risk of toggling in the wrong direction, quickly press *and release normally* the function key you wish to toggle (in this case [Power*]). Then immediately (within 2 seconds) press either [▲ON] or [▼OFF] as desired. The specific toggle will occur.

Toggle keys are labeled with an asterisk on the keypad. They are listed below:

- [Shutter*] + [▲ON] = close the shutter (OPTIONAL)
  [Shutter*] + [▼OFF] = open the shutter (OPTIONAL)
- [Stby*] + [▲ON] = put the projector in standby mode
  [Stby*] + [▼OFF] = leave standby
- [Power*] + [▲ON] = turn the projector on
  [Power*] + [▼OFF] = turn the projector off

- Mute* + ▲ON = turn the audio and menu display on
  Mute* + ▼OFF = turn the audio and menu display off
- OSD* + ▲ON = turn the menu system on
  OSD* + ▼OFF = turn the menu system off

Color

Color

Press Color to adjust the color saturation level, i.e. the amount of color in a video image. Lower settings produce less saturated colors - a setting of "0" produces a black and white image, for example. If the color level is too high, colors will be overpowering and unrealistic. Use ◄ − and + ► until the desired color saturation level is displayed. This is not used when an RGB source is input.

Tint

Tint

Press Tint to adjust the red/green color hue for true color reproduction of NTSC video signals. For best results, adjust tint while displaying a proper test pattern - otherwise, it is recommended that tint remain at its default setting. Use ◄ − and + ► until the desired tint is displayed. This is not used when an RGB source is input.

Detail

Detail

Press Detail to adjust the sharpness of a video image (it is of limited use for non-video). Use ◄ − and + ► until the display is as sharp as desired, keeping in mind that any level of detail above 3 will also introduce a certain degree of noise in the image. Set below 3 to filter the signal and remove noise from a noisy source. This is not used when an RGB source is input.

Cont

Contrast

Press Cont to increase or decrease the difference between light and dark areas of your image. Use ◄ − and + ► until you reach the desired level of contrast, making sure that the whites remain bright but not distorted or tinted (i.e., "crushed").

Bright

Brightness

Press Bright to increase or decrease the amount of perceived light in the image so that black just changes to very dark gray. Use ◄ − and + ► until you reach the desired level. See 3.6, *Adjusting the Image (Image Settings subsection)*. Avoid "crushing", or distorted blacks and/or whites.

Vol

Volume

Press Vol to control the audio level. Use ◄ − and + ► until you reach the desired volume.

Proj

Projector

Press Proj when you want to access a specific projector within a group or if you simply need to see if the local projector is listening. The number appearing in the "Enter Number" window indicates which projector is currently listening to commands, and will match the projector number that has been defined in its *Preferences* menu.

The "Projector" checkbox (read-only) shows whether or not the projector physically connected to a keypad is listening to commands from that keypad. A checkmark means that connected projector is listening; if there is no checkmark, you are communicating with a different projector.

To use a specific projector, enter the 3-digit number assigned to the projector you want to use. Press [Enter] to select, press [Exit] to cancel. If you switch to a projector other than the one you are currently using, the checkmark will be deleted.

To broadcast to multiple projectors, press [Proj] and [Proj] then again without entering a projector number. Keypad commands will then affect all projectors present.

*NOTES: 1) The "Broadcast Keys" option in the Communications menu must be selected for only one (any) projector in a serial network. The keypad in use must be OFF (disabled) for the remaining projectors. See **2.10. Keypad Protocols and Conversion**, and **3.7, Adjusting System Parameters and Advanced Controls.***

[Pixel]

Pixel

Press [Pixel] to access the pixel tracking and pixel phase double slidebar. Adjust pixel tracking first: use [◄ –] and [+ ►] to increase or decrease the frequency of the pixel sampling clock to correct consistency of the image. For proper phase, use [▲ON] and [▼OFF] to increase or decrease pixel phase so that any shimmer disappears and the image is stable throughout. See 3.6, Adjusting the Image (Size and Position subsection) for a complete explanation of tracking and phase.

[Position]

Position

Press [Position] to move the image using the double slidebar. At the slidebar, use [◄ –] and [+ ►] to move the image left or right, use [▲ON] and [▼OFF] to move the image up or down.

[Shutter*]

Shutter (OPTIONAL)

If your projector has a mechanical lens shutter (a.k.a. dowser) installed, press and hold [Shutter*] for approximately 1 second to toggle the shutter closed or open with a single key press (this also blanks the image electronically). Or quickly press and release [Shutter*] and follow immediately with [▲ON] or [▼OFF] if you want to guarantee the correct toggle (useful if you are unsure of the present status). Close the shutter whenever you want to mute all display yet maintain access to projector functions. Open the shutter to regain the display. With no shutter installed, [Shutter*] still blanks the image electronically, but the blanking is not quite as black.

*NOTES: **1)** The status of the shutter is shown in the LCD window on the rear panel of the projector. **2)** Upon power-up, the shutter is open. **3)** The lamp remains on.*

[Mute*]

Mute

Use [Mute*] to mute audio and/or hide the current menu. Press [Mute*] and hold for approximately 1 second to toggle the audio on or off with a single key press. Or quickly press and release [Mute*] and follow immediately with [▲ON] or [▼OFF] if you want to guarantee the correct toggle (useful if you are unsure of the present status). In either case, a small message appears on screen to signify mute status.

[Func]

Function Key

When no menus are on-screen or active, press [Func] followed by a 2-digit number to enable a specific color or colors in the display. For example, [Func] [6] [4] will display only red and green data, [Func] [6] [7] will display all colors data. The list of available color combinations is shown below and also appears on the back of the IR remote keypad. Color enabling can also be accessed through the menu system rather than these shortcuts.

Func 6 1	= Red
Func 6 2	= Green
Func 6 3	= Blue
Func 6 4	= Red and Green
Func 6 5	= Green and Blue
Func 6 6	= Red and Blue
Func 6 7	*= All colors*

NOTE: Once Func *is pressed (with no OSD present), the projector will not respond to non-numeric entry until 2 digits have been entered or until 5 seconds of inactivity have elapsed.*

Use of the Func key within the menu system is noted with the appropriate topic elsewhere in Section 3. For example, press Func in the Channel Setup menu to enable deletion or copying of a channel.

OSD*

OSD (On-screen display)

Press and hold OSD* for approximately 1 second to toggle menus on or off (i.e., visible or invisible). Or press OSD* followed immediately by ▲ON or ▼OFF to guarantee the correct toggle direction (useful if you are unsure of the present status). Note that invisible menus are fully functional.

NOTES: 1) With OSD on, you can still mute menus, error messages, slidebars, etc. with the appropriate setting in the Preferences menu. 2) The status of the OSD* *key is displayed in the LCD window on the rear panel of the projector.*

Help

Help

Press Help for detailed information about any current menu and highlight. Press Help again to exit. Press Help to access the *General Help* menu consisting of *Using Help, Projector Setup, Keypad, Channel Selection* and *Status LEDs*. Press Exit to leave *General Help*.

Test

Test

Press Test to display one of the available test patterns. Press Test again to display the next available pattern in the sequence. Test will exit after the last pattern, or press Exit at any time to remove the current test pattern from the screen and return to the current external source.

NOTE: For a complete list of all test patterns, see the Advanced menu description later in Section 3.

Keypad operating settings (protocols)

The remote keypad and the optional wired keypad both store keypad operating settings (called *protocols*) in memory. In some advanced applications, such as when you want to use two separate keypads to control two projectors independently, you may want to override the original protocol set at manufacture (which is "A or B") for one of the keypads. See section *2.10, Keypad Protocols and Conversion* for complete instructions.

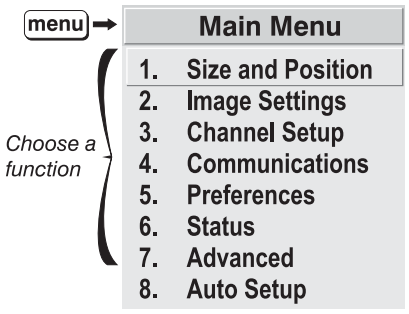


Figure 3.3. Main Menu

Most of the controls for the projector are accessed from within the projector's menu system. There are several groups of related *functions*, with each group selectable from the *Main* menu as shown at right. Press Menu at any time to display the *Main* menu.

On the keypad, either enter the number corresponding to the function menu you wish to access, such as 2 for the *Image Settings* menu, or use the ▲ ▼ keys to highlight the desired option and press Enter . The function menu you selected will then appear. If you select "Auto Setup", this will not activate a separate function menu but rather begin an automated process of optimizing critical display parameters such as size, position, pixel tracking, etc.

Once you have a function menu displayed, navigate in a similar manner-enter a menu option number for any numbered option, or use ▲ ▼ to move the highlight and press Enter at the desired option. Extra long menus have a scroll bar on the right-use the arrow keys to see the remainder of the menu. Items that are locked out or do not pertain to the current action appear dimmed and cannot be selected.

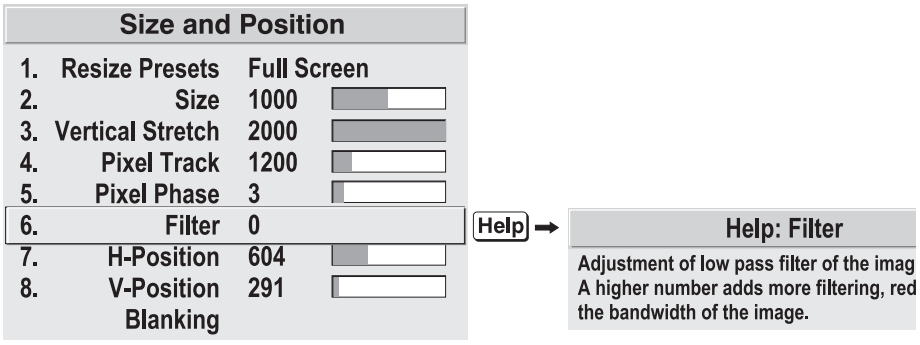
NOTES: ***1)*** *If there is no signal present, all source-dependent adjustments are disabled.* ***2)*** *After 15 minutes of inactivity, the projector leaves the menu system and returns to the presentation.* ***3)*** ***The Status*** *menu is read-only.*

When finished with a function menu, do one of the following:

- Press Exit to return to the previous screen
- Press Menu to leave the menu system and return to the active source.

On-line Help ⏩

If at any time you are uncertain what to do next, press Help to display detailed information about the current menu or highlighted option. A scroll bar appears on the right-hand side of a help window if there is additional text-use the arrow keys to scroll. Press Help again to exit.



With no menus active, press Help to access general *Help Topics*. Scroll as necessary within a topic. Press Exit to return to the source.

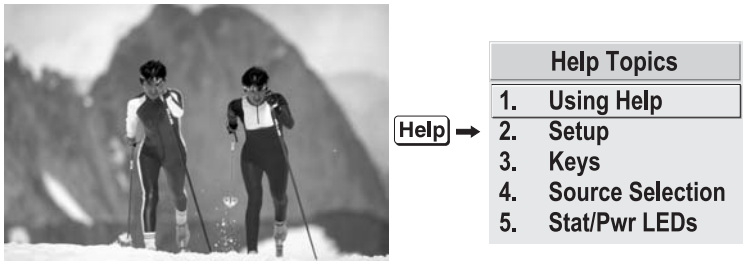


Figure 3.4. Accessing General Help Topics

At the bottom of some menus, a line of 'hint' text also appears.

Time-outs ⏩

Whenever there are on-screen menus such as when there is a slidebar, menu, message or test pattern displayed, you have limited time in which to make a keypad entry before the graphic disappears. These time-outs vary depending on the current display, as shown in the following chart:

TIME-OUTS	
Slidebar (from pres.)	***5 seconds***
Slidebar (from menu)	***15 minutes***
Lamp Timer Msg.	***30 seconds***
Channel entry	***5 seconds***
Other	***15 minutes***

Using Slidebars and Other Controls ⏩

Most of the function menus allow you to change settings by using slidebars, checkboxes, and pull-down lists. To select a slidebar, toggle a checkbox status, or view a pull-down list, do one of the following within the function menu:

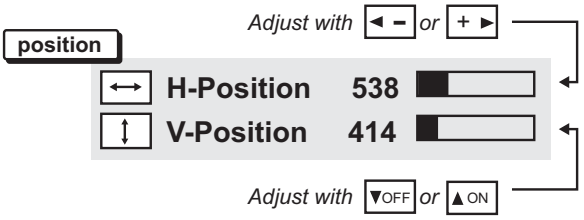
- Enter the menu option number corresponding to the setting you wish to change (for example, press 2 to select Vertical Stretch in the *Size & Position* menu).
- Or move the highlight to the desired parameter and press Enter .
- Or move the highlight to the option desired and press ◄– or +► .
- Or bypass the menus entirely and use a single key to immediately access an adjustment during your presentation (*note: applies only to options having their own key, such as Color, Tint, Detail, Contrast, Brightness, Volume, Pixel and Position*).

Once selected, change the setting as desired (see below) and press Enter to save and return to the current function menu.

Slidebars in menus - The current value for a given parameter, such as size or vertical stretch, appears to the left of its slidebar icon (window).

This number often expresses a percentage, or it may have units associated with it (such as pixels, degrees Kelvin, etc.), depending on the specific option. Press ◄– or +► to gradually adjust the setting up or down-both the number and the length of the bar change accordingly (for continuous adjustment, hold down the desired arrow key). Or press Enter to activate a slidebar text box for specific number entry via the keypad, then press Enter or ◄– or +► to save (or press Exit to cancel).

Double slidebars - In double slidebars, such as the pixel tracking/pixel phase double slidebar, adjust the top slidebar with ◄– or +► as desired. When you have finished with the top slidebar (whether changed or not), adjust the bottom slidebar with ▲ON or ▼OFF . When you are done, press Exit to return to your presentation. For fast continuous adjustments, hold down the desired arrow key.



"Direct" slidebars - For quick access, you can often use a slidebar (or double slidebar) without traveling the menu system. For example, simply press Cont to immediately display the same contrast slidebar accessed with the **Contrast** option in the *Image Settings* menu. Direct slidebars are listed below.

LIST OF DIRECT SLIDEBARS	
H-Position or V-Position	Position
Pixel Tracking or Phase	Pixel
Volume	Vol
Contrast	Cont
Brightness	Bright
Color	Color
Tint	Tint
Detail	Detail

Use the arrow keys to adjust a direct slidebar, or press Enter and enter a specific number from the keypad , then Enter or ◄– or +► to save (or Exit to cancel). When you are done, press to save and return to your presentation.

NOTES: 1) You can still adjust a direct slidebar as usual if the menu display is turned off (see OSD or **Preferences** menu) - the slidebar just won't be visible. 2) A direct slidebar disappears if it is not used within 5 seconds.*

Checkboxes - Conditions are present if its adjacent checkbox contains a checkmark. To toggle the checkbox, simply highlight and press Enter, or highlight and use +► to check and ◄– to uncheck. For a checkbox that is numbered, simply enter the number of the option to toggle the checkbox.

Pull-down lists - To see a pull-down list of options available for a given parameter labeled with a ▼, you can:

- Highlight it and press Enter
- Or enter the menu option number.

Use ▲ON or ▼OFF keys to navigate up and down within the list (the current choice is noted with a small ▶). Press Enter to choose an option from the list, if desired.

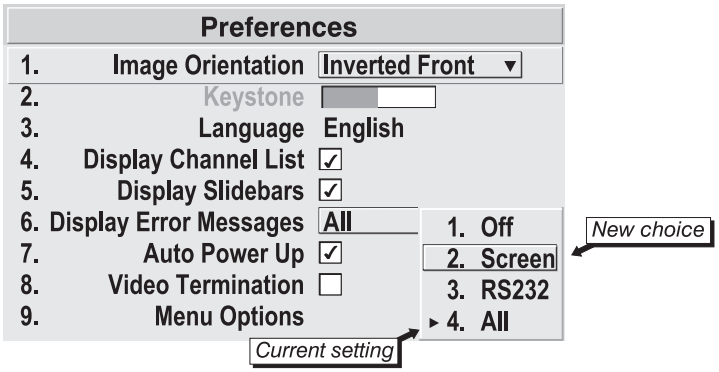


Figure 3.5. Example of Pull-Down List

Or, if you prefer to quickly scroll through a list without first pulling it down, highlight the option and use ◄– or +► . Press Enter when the desired choice appears.

NOTES: 1) Press ◄– or +► to jump between "pages" in an extra long pull-down list. 2) Press Enter while in a pull-down list to ***cancel*** *any change.*

Editing Text ⏩

ACTIVATE THE EDIT WINDOW: To enter or edit text, highlight the desired parameter (such as a channel name) and press Enter to activate its adjacent edit window. Any previously entered text is displayed with its first character highlighted in a square cursor, signifying that this character is ready for editing.

NAVIGATE WITHIN THE EDIT WINDOW: Press +► to move the cursor forward or ◄– to move the cursor backwards as desired.

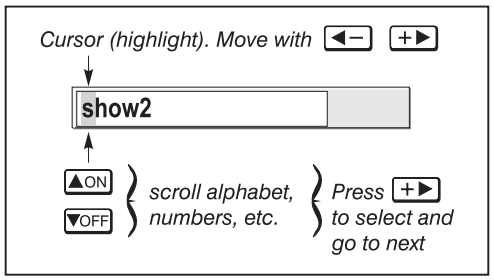
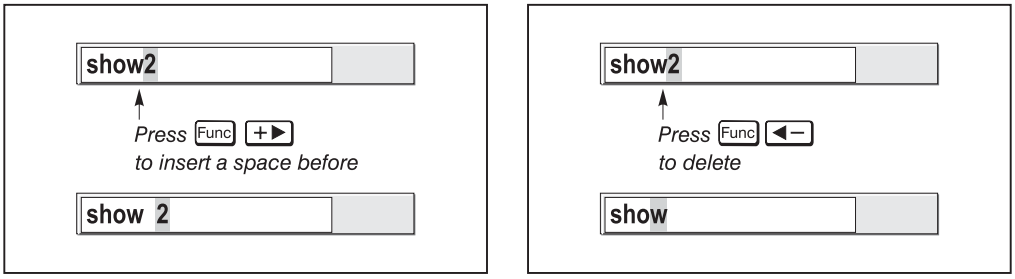


Figure 3.6. Entering Text

EDIT A CHARACTER: To edit a highlighted character, use ▲ and ▼ to scroll through the alphabet, numbers, spaces and punctuation available. When the character you need appears, press +► to select it-the cursor will move to the next character of current text, if present. Note that you can also enter a number directly from the keypad-it will be accepted and the cursor will move on.

ADD OR DELETE A CHARACTER OR SPACE: To insert a space at the cursor location, press Func +► . To delete a highlighted character (or space), press Func ◄– .



PRESS Enter WHEN FINISHED: To accept the edits and move out of the edit window, press Exit .

NOTE: Press [Exit] *at any time to cancel changes and return to the previously-defined text.*

Editing Numerical Values ⏩

Enter numbers directly from the keypad in order to specify numbers representing projectors, channels (source setups), switchers, or slots. As each digit is entered, it is displayed and the cursor moves on. Note that channel numbers are defined with 2 digits-for example, if you enter only a single digit (like "7") for a channel number, the channel will automatically be defined as "07". Use "07" to utilize this channel.

NOTES: 1) Once you enter the first digit, this digit replaces all old digits. 2) If you press any non-numbered key, the number entered up to that point is accepted and updated as the new value. 3) Press [Exit] *to cancel editing of numerical values.*

3.5 Using Inputs and Channels

NOTE: See ***Section 2, Installation and Setup****, for a full explanation of how to connect a variety of sources to the projector.*

The projector stores and automatically recalls up to 99 different channels (source setups) for a variety of inputs. This memory feature allows you to define and conveniently use a wide variety of customized setups rather than having to repeatedly re-configure the projector for different presentations. Each physical source (i.e., *input*) can have several different channels associated with it.

Selecting an Input ⏩

INPUT - An input simply describes a physical location for an incoming signal connection. These connections are always either on the projector itself (one of the four inputs at the rear of the projector).

EXAMPLE:

[Input] [0] [1] = use source connected to the projector, slot #1 (i.e., [Input1])

Pressing the appropriate direct key - [Input1] , [Input1] , [Input1] , or [Input1] - is a quick and seamless way to display from one of the four inputs connected at the rear of the projector.

If it is the first time you have used the source/input (or if you used the input but did not define a channel by adjusting anything), the projector will recognize the new input signal based on its frequencies and polarities, and will automatically display an image according to default settings for such a signal. Note that a graphic source will resize into a full-screen image, whereas video or HDTV sources will resize only as much as possible while maintaining their aspect ratio.

If you used the source once before and changed a display parameter such as contrast, V-Position etc., then a channel was automatically created and still exists in projector memory (see below). Using an [Input] key will automatically recall this channel-and all its setup parameters-and update the display accordingly.

If more than one channel exists for the input, the image will be displayed according to the setup parameters for the first channel with matching characteristics.

CHANNEL - A channel is a collection of measurements, locations and settings that tailor a display to your specific needs. Since source types and applications can vary greatly, you will likely want to adjust and define a wide variety of parameters, such as brightness, contrast, tint, size, etc., in order to customize and optimize the display coming from a particular source. For example, the display settings you choose for a VCR source may be very different from those you choose for a high resolution computer source, or one signal may simply vary from another signal used earlier through the same input location. Once you have adjusted a display parameter, such as pixel tracking or contrast, all current settings are collectively stored in the projector's memory as a unique 2-digit channel, such as [0] [9] . You can have numerous distinct channels available for the same input, any of which can be selected by using the key on the keypad followed by the 2-digit channel number.

*NOTE: The [Chan] key may display a channel list or not, depending on what you have defined within the **Preferences** menu (see **Preferences** later in this section). Shown at right is a sample channel list available from [Chan] .*

In order to use channels ([Chan] on the keypad), you must first create them. See below.

Creating a New Channel ⏩ - AUTOMATIC -

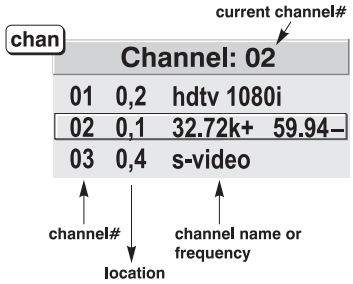
To use a new source with the projector, a new channel must be added to projector memory so that the projector will respond properly to an input signal from that source in the future. A new channel can be created automatically, as described here, or it can be copied from an existing channel and then edited as necessary (see ***Copying or Deleting Channels*** later in this section).

When you select a direct input (press [Input] or [Input1] , [Input1] , [Input1] , or [Input1]), the existing channels in the projector are searched for matching input and signal parameters. If no match to the incoming input signal is found in the currently defined channels, a new channel is temporarily created based on factory-defined defaults for this signal. The *channel number* assigned to this channel is the lowest available number from 01-99.

*NOTES: **1)** An automatic channel will be discarded unless one or more of its parameters are changed, and will not appear in the **Channel List** (see below). **2)** If two channels have the same distinguishing source characteristics except for the reversal of sync connectors (i.e., H-sync and V-sync, are switched), they are still defined as distinct channels. **3)** You cannot define a new channel without a signal present.*

If the incoming signal *does* match an existing channel, the image will be set up and displayed as usual according to the parameters currently defined for that channel.

USING A CHANNEL: You can normally select a channel at any time by pressing Chan (see right). If you want to prevent a channel from appearing in this list, you must edit the channel as described in Channel Edit later in this section. Such a channel can still be selected by entering its number as shown at right.



*NOTE: 1) The current channel is highlighted upon entering the **Channel List**, or, if this channel is not displayed in the list, the first channel in the list is highlighted. 2) Channels created automatically do not appear in the **Channel List** unless a parameter has been changed.*

What Channels Are Defined So Far? ⏩

All available channels are listed in the *Channel Setup* menu, which describes how each channel can be accessed and which serves as the gateway for editing, copying and deleting channels.

Press Menu to display the *Main* menu. To display the *Channel Setup* menu, press 3, or move the highlight to the *Channel Setup* option and press Enter. The *Channel Setup* menu will appear (see sample at right), with the active channel highlighted.

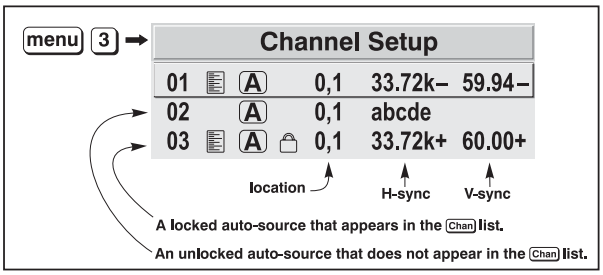

menu 3
Channel Setup
01 A 0,1 33.72k– 59.94–
02 A 0,1 abcde
03 A 0,1 33.72k+ 60.00+
location
H-sync
V-sync
A locked auto-source that appears in the Chan list.
An unlocked auto-source that does not appear in the Chan list.

Figure 3.7. All Channels Appear in the Channel Setup Menu

This menu lists all channels defined so far and indicates how they are connected to the projector. The far left column contains current channel numbers defined. The values in the far right columns indicate horizontal and vertical frequencies-if a name has been defined for this channel, it appears here instead. Other columns contain details pertaining to each channel setup, such as its switcher number, slot location and a variety of icons indicating access to the channel. See *Editing a Channel Setup* for details.

If you have more than a handful of channels, use ◄– and +► to see the remaining channels not visible in this initial display.

To copy, delete or edit any of the channels listed in the *Channel Setup* menu, highlight the desired channel and do one of two things:

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- Press Func if you want to copy the selected channel or delete this or other channels. See *Copying or Deleting a Channel* below.
- Press Enter if you want to edit channel setups (i.e., non-image related parameters) for the selected channel. See *Editing a Channel Setup*, below.

Copying or Deleting Channels ⏩

TO COPY A CHANNEL, highlight the desired channel in the *Channel Setup* menu, then press Func to go to the *Channel Copy/Delete* submenu. Select "Copy" and press Enter -a new channel will be created. It is identical to original, which still remains, but it is identified with the next available number from 01-99. If you change your mind and do *not* want to copy the current channel, press Exit to cancel and return to the previous menu. Copying channels is a quick method for creating numerous channels, each of which can then be edited and adjusted for a variety of presentations in the future.

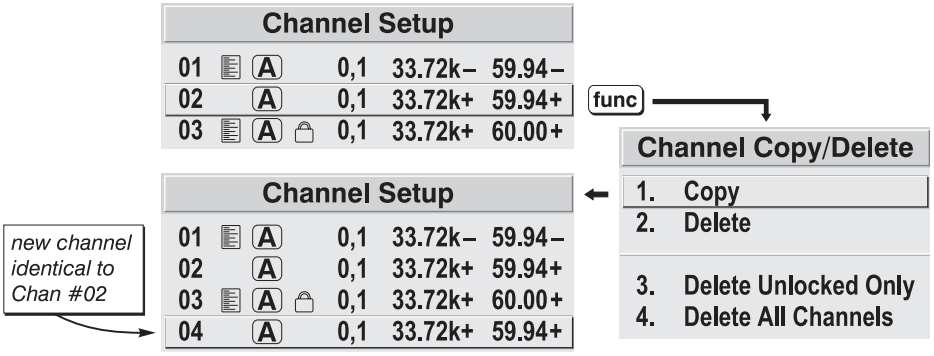


Figure 3.8. Copying A Channel

TO DELETE A CHANNEL, highlight the desired channel in the *Channel Setup* menu, then press Func to activate the *Channel Copy/Delete* submenu. Select "Delete" and press Enter -a confirmation window will appear to make sure that you really want to delete this channel.

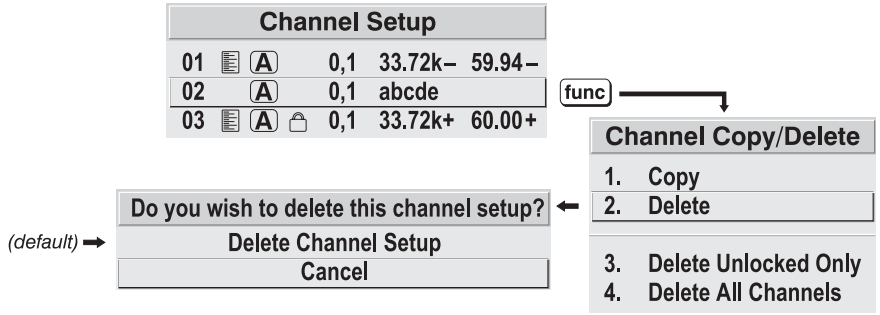


Figure 3.9. Deleting a Channel

TO DELETE MULTIPLE CHANNELS, highlight any channel in the *Channel Setup* menu and press Func to go to the *Channel Copy/Delete* submenu. Select "Delete Unlocked Only" and press Enter to delete all unlocked channels. Or select "Delete All Channels" to delete all channels, even those that are locked. In either case, the current channel will remain but will be redefined from projector defaults.

NOTE: For any deletion, a confirmation box appears to make sure that you really want to delete. Select "Cancel" (default) if you don't want to delete after all.

Editing a Channel Setup ⏩

The basic setups that describe how and where a channel can be accessed are listed in the *Channel Setup* menu. These channel setups can be edited at any time in the *Channel Edit* submenu.

CHANNEL EDIT - STEP 1

Press Menu to display the main menu. To display the *Channel Setup* menu, press 3, or move the highlight to the *Channel Setup* option and press Enter. The *Channel Setup* menu will appear.

CHANNEL EDIT - STEP 2

To edit parameters shown in the *Channel Setu*p menu, select the relevant channel and press Enter. The *Channel Edit* menu will appear similar to the sample shown in Figure 3.10.

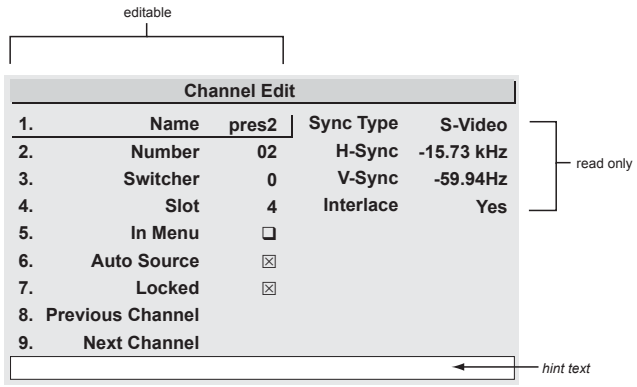


Figure 3.10. Channel Edit Menu (SAMPLE)

CHANNEL EDIT - STEP 3

If desired, edit the following channel setups in the *Channel Edit* menu:

- **CHANNEL NAME**: An alpha-numeric label can be defined and/or changed here. Channel names can be up to 12 characters in length.

- **CHANNEL NUMBER**: A channel number from 01 to 99 can be changed here. *NOTE: If you enter a channel number that already exists, a dialog message appears indicating that this number is already in use-assign a different channel number.*

- **SWITCHER NUMBER**: "0" represents the projector itself. This will likely always be the case for the VX-5c.

- **SLOT**: 1 (Input1), 2 (Input2), 3 (Input3), or 4 (Input4) for projector inputs.

- **LOCKED**: If checked, all of the image settings for this channel are disabled. If unchecked (default), all available image settings can be adjusted as desired.

- **IN MENU**: If checked (default, except for automatically defined channels with unchanged parameters), this defined channel will then appear in the list available when Chan is pressed. If unchecked, the channel must be accessed via Chan on the keypad or via the Auto Source function. *NOTE: On-screen display of the channel list is an option that must be set in the Preferences menu.*

- **AUTO SOURCE**: If checked, (default), the projector can automatically locate this channel when an incoming input signal matches. If not checked, the projector can locate the selected channel only when it is directly selected via on the keypad-and a change in input signal will not result in a channel change.

- **PREVIOUS CHANNE**L: Select this option to see or change *Channel Edit* settings for the previous channel in the *Channel Setup* list.

- **NEXT CHANNEL**: Select this option to see or change *Channel Edit* settings for the next channel in the *Channel Setup* list.

3.6 Adjusting the Image

Most options for image adjustments can be accessed through two menus: *Size and Position* (Menu 1) and *Image Settings* (Menu 2), both of which are listed in the *Main* menu. While in either of these two menus, you can change settings affecting the image from the current channel by working with the appropriate slidebars, checkboxes and pull-down lists. Exit will always return to the previous menu (or to the presentation, if from the *Main* menu) and accept any changes you may have made.

From your presentation, you can access any of the individual options in these menus by pressing Menu followed by the appropriate two-digit number representing their location in the menu system. For example, press Menu 2 6 to quickly access the "color temp" option in the *Image Settings* menu.

Note that for certain options, you may prefer to use a "direct key" from presentation level to go directly to a particular option rather than traveling through the menu system at all (*note: this is not available for all display parameters*). For example, press Cont to access the "contrast" slidebar immediately. Press Exit to return to your presentation.

NOTE: 1) To hide the "direct" slidebars only, make sure the Display Slidebars option in the ***Preferences*** *menu is unchecked. 2) To hide the entire menu system from view, toggle the on-screen display OFF: press and hold the OSD* key.*

Auto Setup ⏩

If you want the projector to quickly set up the image for you, select "Auto Setup" from the *Main* menu. A confirmation box will ask if you really want to continue, in which case display parameters listed in the Table below will be set for you. An "Auto Setup" can save time in setting up an image, and you can also make further adjustments as desired.

What an "Auto Setup" Does	
OPTIMIZES:	SETS TO DEFAULT:
Pixel Tracking & Phase	***Contrast & Brightness***
Size	***Auto Input Level (off)***
Vertical Stretch	***Blanking***
Position	***Detail*** **(if video source)**
Input Levels **(if analog source)**	***Filter***
	Luma Delay

Image Size and Position

The Size and Position menu allows you to increase or decrease the size of your image, change its proportion (aspect ratio), move the image to a specific area of the screen, and refine other related parameters. Use Size and Position controls to match the image precisely to the screen size and aspect ratio needed for your application.

Refer to "Using Slidebars and Other Controls" (earlier in this section) if you need help using any of the following slidebars or pull-down lists to alter your image.

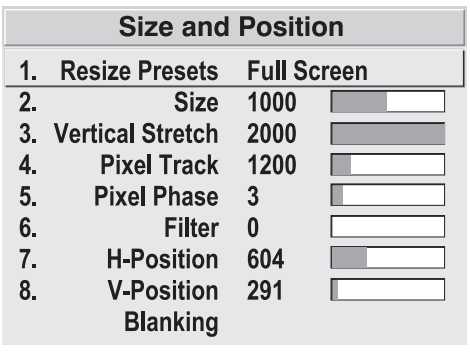


Figure 3.11 Size and Position Menu

Changes made to the *Size and Position* menu are applied immediately and are saved when you exit the menu (press Exit or Menu).

Resize Presets

Use *Resize Presets* to quickly display an image in its native resolution (including anamorphic) or to automatically resize an image to fill the screen. The value for Size, *Position* and *Blanking* parameters (described below) will, in turn, change as necessary without your having to set them manually.

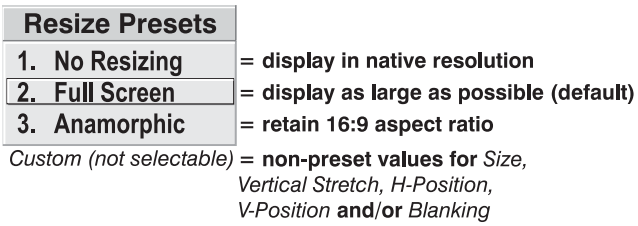

Resize Presets
1. No Resizing
2. Full Screen
3. Anamorphic
Custom (not selectable)
= display in native resolution
= display as large as possible (default)
= retain 16:9 aspect ratio
= non-preset values for Size, Vertical Stretch, H-Position, V-Position and/or Blanking

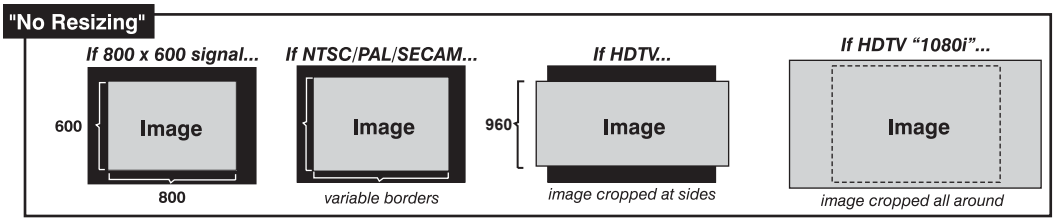
Figure 3.12. Resize Presets Submenu

- **DEFAULT SETTING**: When displaying a new source, the default "Full Screen" option is in effect, meaning that your image will fill the screen as fully as possible for the type of source present:

  * ***A graphic image*** will resize to fill the screen, regardless of its original aspect ratio.
  * ***A video image*** will resize to fill the screen as closely as possible while still maintaining its aspect ratio. Since a video image is not precisely 4:3, there will likely be a handful of unused "border" pixels.
  * ***An HDTV wide-screen (16:9) image*** will resize to fill the screen horizontally in a 16:9 aspect ratio (i.e., with top and bottom borders).

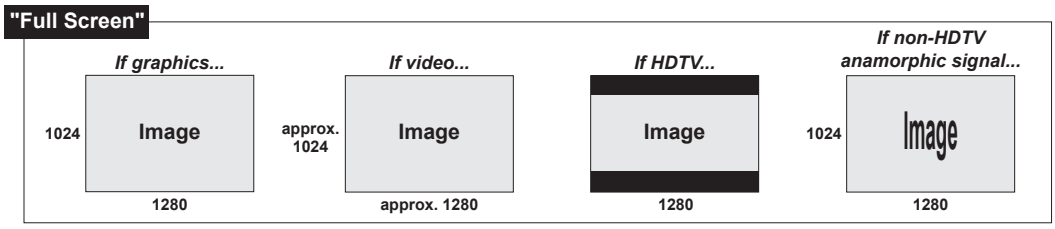
- **WHEN "CUSTOM" APPEARS**: The "Custom" descriptor appears in the automatically when any of the values for *Size, Vertical Stretch, H-Position, V-Position* or *Blanking* do not correspond to those for a preset. It should not appear as an option in your *Resize Presets* pull-down list.

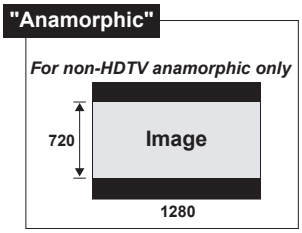
- **SELECT "NO RESIZING"** to display the image in its native resolution, which may be small or larger than 1280 x 1024. All *Size, Vertical Stretch, H-Position, V-Position* or *Blanking* values will change accordingly. For example, for a source with a native resolution of 800 x 600, "No Resizing" will center a small image within a black border. Conversely, an HDTV image is wider than 1280 and will be cropped on the sides or, in the case of "1080i" HDTV, cropped at top and bottom too.



- **SELECT "FULL SCREEN"** (default) to center and display your image as large as possible for the present source. Note that video and HDTV both maintain their original aspect ratios (i.e., there will be at least a few unused pixels), other sources change their aspect ratios as necessary

order to fill the screen. Non-HDTV (16:9) anamorphic images, common on DVDs, will be stretched vertically. With the exception of HDTV (16:9), the "Full Screen" setting produces an aspect ratio that is either almost or exactly 4:3.





● **SELECT "ANAMORPHIC"** to display an entire non-HDTV "wide screen" (anamorphic) image in its native 16:9 aspect ratio. The image will fill the screen from left-to-right, but will not use all vertical pixels available (top and bottom will be black). If you do not choose "Anamorphic" when a non-HDTV anamorphic image is present, the default image will be stretched vertically, characterized by obvious distortion and "thin people".

NOTE: Use "Anamorphic" for regaining a 16:9 display of non-HDTV anamorphic sources only (typically found on some DVDs, for example). For HDTV, the "Full Screen" default will produce the same result.

Size
Size controls both the image *width* and *height* in tandem, maintaining the original aspect ratio (proportion) of data from the incoming signal. 1000 = no resizing.

Vertical Stretch
Vertical stretch adjusts the height the image while keeping the width constant. Use Vertical Stretch to display data from the incoming signal in a different aspect ratio. 1000 = no vertical stretch (i.e., native aspect ratio).

Pixel Track
(**SHORT CUT**: Press Pixel and adjust the top slidebar.)
Pixel tracking adjusts the frequency of the pixel sampling clock, indicated by the number of pixels per line, so that all pixels generated by a particular source are sampled. Proper pixel tracking ensures that the image quality-whether good or poor- is *consistent* across the screen, and that pixel phase can be optimized (below).

NOTE: By default, the projector will sample at the correct frequency for most sources.

Pixel tracking is adjusted most effectively using a good test pattern, such as a smooth gray consisting of a clear pattern of tiny black and white dots, or a similar "half on, half off" graphic image, such as the *Windows* shutdown screen. Steady flickering or several soft vertical stripes or bands across the entire image indicates poor pixel tracking. Adjust the slidebar until the stripes broaden to the point where one large stripe fills the image. Again, the image may still exhibit some noise. See *Pixel Phase*.

Pixel Phase
(**SHORT CUT**: Press Pixel and adjust the bottom slidebar.)

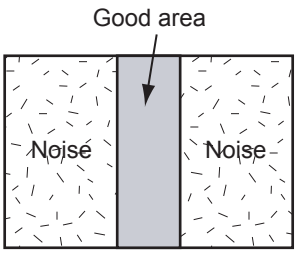
Pixel phase adjusts the phase of the pixel sampling clock relative to the incoming signal. It is used primarily for adjusting RGB inputs.

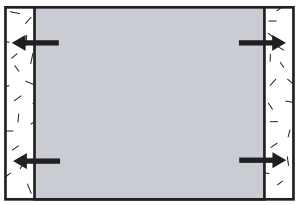
*NOTE: Adjust pixel phase **after** pixel tracking is properly set.*

Adjust pixel phase when the image (usually from an RGB source) shows shimmer or "noise". Pixel phase adjustment is done most effectively from within a proper test pattern, such as a smooth gray consisting of a clear pattern of tiny black and white dots, or a similar graphic image, such as the *Display mate* program. Adjust until the image is stable and each dot is clearly defined. Using the numbers on the slidebar as a guide, you will notice that you can actually stabilize the image at more than one point-i.e., you may find that the image appearance at "11" is identical to the image appearance at "38", thus you can select either setting.

Filter
Filter applies a low pass filter to the input signal. This removes high frequencies which can improve pixel phase noise but which also reduces signal bandwidth. Note that most signals will not require any filter adjustment-use the filter option only if standard pixel tracking and phase adjustments do not adequately clear up a "noisy" signal. For best results:

1. Optimize Pixel Tracking and jot down the value.
2. Optimize Pixel Phase
3. If the image is still too noisy, return to Pixel Tracking and "mis-adjust" so that 2 vertical bands of noise appear, separated by a good center band. See right.
4. Adjust Filter to maximize the width of the good area. See right.
5. Return Pixel Tracking to its correct setting from Step 1.
6. Readjust Phase.





NOTE: "Filter" affects only the current signal.

H-Position
(**SHORT CUT**: Press Position and adjust the top slidebar.)

This option moves picture right and left.

NOTE: The value shown represents where the approximate center of the image lies in relation to the total number of pixels available horizontally. This varies widely according to the signal-watch the image while adjusting.

V-Position
(**SHORT CUT**: Press Position and adjust the bottom slidebar

This option moves the picture up and down.

NOTE: The value shown represents where the approximate center of the image lies in relation to the total number of pixels available vertically. This varies widely according to the signal-watch the image while adjusting.

Blanking: Top, Bottom, Left or Right

This submenu blanks (turns to black) the top, bottom, left, or right edge of the image so that any unwanted information is cropped from view. For example, when displaying native size video you may want to blank out a few of the top lines.

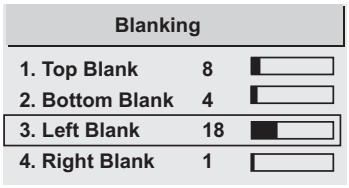


Image Settings ⏭

Use any of the following slidebars, pull-down lists or the checkbox to alter your image. Refer to "*Using Slidebars and Other Controls*" (earlier in this section) if you need help in selecting options and adjustments. Changes made to the *Image Settings* menu are applied immediately and are saved when you exit the menu (press Exit or Menu).

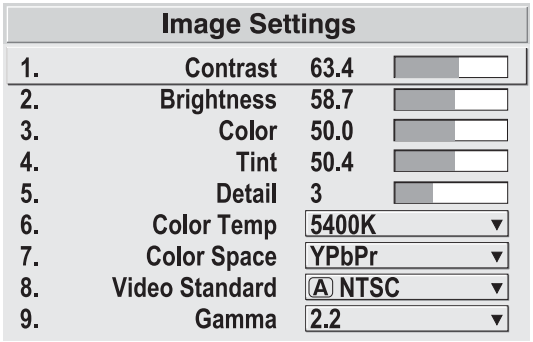


Figure 3.13. Image Settings Menu

Contrast

(SHORT CUT: Press Enter and adjust the slidebar.)

"Contrast" increases or decreases the perceived difference between light and dark areas of your image (0-100). If contrast is set too high, the light parts of the image lose detail and clarity. If set too low, the light areas will not be as bright as they could be and it may be difficult to distinguish between foreground and background information. Adjust so that whites remain bright but not distorted or tinted. For best results, keep close to 50.

NOTE: If environment lighting changes, it may be necessary to re-adjust both options.

Brightness

(**SHORT CUT**: Press Bright and adjust the slidebar.)

"Brightness" increases or decreases the amount of perceived light in the dark part of the image (0-100). If video or data is displayed with a black background, adjust until the background just changes from black to very dark gray. For best results, keep close to 50.

Color

(**SHORT CUT**: Press [Color] and adjust the slidebar.)

"Color" adjusts color saturation level, or the amount of color in a video image. For example, setting Color to "0" produces a black and white image. If Color is set too high, the color levels in the picture will be over-powering and unrealistic. Use [◄–] or [+►] until the desired color saturation level is displayed. *NOTE: COLOR is not available in the RGB mode.*

Tint

(**SHORT CUT**: Press [Tint] and adjust the slidebar.)

"Tint" adjusts color hue to obtain true color reproduction of NTSC video signals. Use [◄–] or [+►] until you reach optimum balance of red-to-green in your image. It is best to adjust tint while displaying a proper SMPTE color bar test pattern-otherwise, it is recommended that tint remain at its default setting. *NOTE: TINT is not available in the RGB mode.*

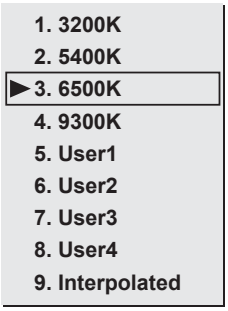
Detail

(**SHORT CUT**: Press [Detail] and adjust the slidebar.)

"Detail" adjusts the sharpness of the video image. Use [◄–] or [+►] until the display is as sharp as possible, keeping in mind that any level of detail above 3 (default) will increase the level of detail as well as introduce some level of noise in the image. Set below 3 to filter the signal and remove noise from a noisy source. Keep at 3 to apply no detail. *NOTE: DETAIL is not available in the RGB mode.*

Color Temp

"Color Temp" applies either a preset color temperature (3200K, 5400K, 6500K, 9300K) or any previously defined Interpolated or custom "User" color temperature. All temperatures are measured in degrees Kelvin and represent the "coloration" (reddish or bluish) of the whites displayed by the projector-the lower the temperature, the more reddish the whites, the higher the temperature, the more bluish the whites.



*NOTE: Custom temperatures ("User" or "Interpolated") can be defined in the **Advanced Color Temperature** menu-until then, these choices all default to 6500K. See **Section 3.8, Adjusting System Parameters and Advanced Controls**.*

Color Space

This option determines how the color components of an input signal are decoded for accurate color in the display. Selecting a color space option is useful only for analog signals connected to **INPUT 1** or **INPUT 2**. Although the color space for such a signal is automatically determined by the projector, in some circumstances you may wish to override this and manually set a different color space.

*NOTE: For digital signals or for signals connected to **INPUT 3** or **INPUT 4**, the color space function is entirely automatic and the pull-down list disabled.*

The current color space appears in the Image Settings menu. Press Enter to select a different option:

- Select RGB unless you are using component video at **INPUT 1** or **2**.
- Select **YPbPr** (video) if you are using a standard definition televised signal (SDTV)
- Select **YPbPr (HDTV)** if you are using a high definition decoder (HDTV).

Video Standard

The projector automatically detects the video standard present and displays the name of this standard here. Press Enter to view or select a different video standard from a complete list available to the projector (some will appear disabled, depending on the current incoming signal). Selecting a specific standard forces the projector to process the signal according to this standard.

NOTE: This option should remain set at "Auto" for all instances EXCEPT: 1) a poor quality input signal or 2) a black-and-white video signal. In order to detect and display such signals, specify the relevant standard.

Gamma

NOTE: Gamma does not normally require adjustment and is intended for experienced users only.

The "Gamma" option affects the shape of the gamma curve representing the levels and types of grays available between minimum input (black) and maximum (white). Generally the best gamma curve is one that produces maximum contrast, brightness and color performance. See Figure 3.14.

THE 1.0 SETTING greatly reduces apparent contrast of mid-range signals and represents a straight transition from black to white.

THE DEFAULT SETTING OF 2.2 is a normal and smooth gamma curve recommended for virtually all sources, producing good contrast and smooth gray transitions without distorting colors.

SETTING OF 2.2S OR 2.8S are not true gamma curves but are slightly S-shaped, resulting in more intense mid-grays. If you use an "S" option, mid-levels in your display will be brighter (they have more intensity) without whites crushing, however this abnormal grayscale will also likely disturb color accuracy. Likewise, the **2.2SN** curve is also distorted, but can improve some NTSC signals.

THE 2.8 SETTING offers more apparent contrast of mid-range signals with fewer grays, and may appear darker than the 2.2 setting. This is the official standard for PAL and SECAM signals but it is almost never used for real signals which use 2.2.

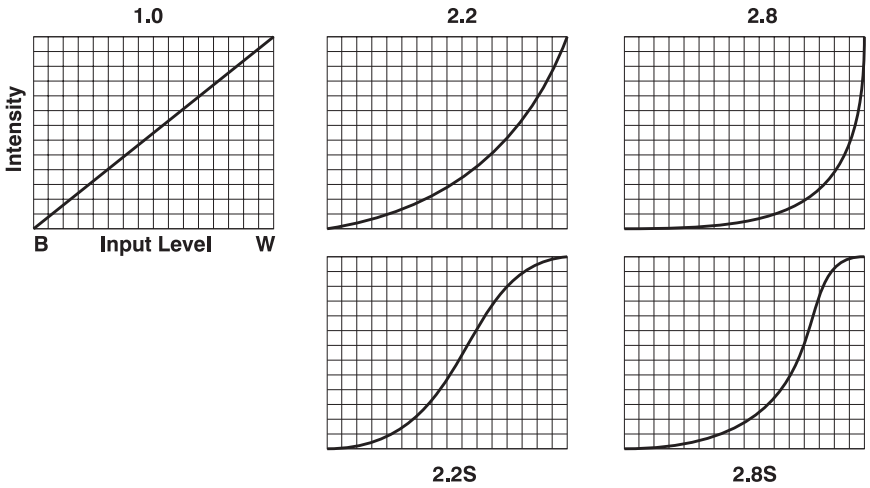


Figure 3.14. Selected Gamma Curves

3.7 Adjusting System Parameters and Advanced Controls

Use the *Communications, Preferences* and *Status* menus to display and/or alter overall system parameters rather than those that affect a specific source or channel.

Use the *Advanced* menu whenever you need to work with or replace the lamp, select a test pattern, define a new color temperature, or access lesser-used image control settings intended for experienced users.

Communications ⏩

Use the checkboxes and pull-down lists in the *Communications* menu to alter the methods or types of communication to and from the projector. Refer to "*Using Slidebars and Other Controls*" subsection if you need help. Changes made to the *Communications* menu will be saved when you exit the menu.

Communications		
1.	Baud Rate	38400
2.	Front IR	A or B
3.	Back IR	A or B
4.	Wired Keypad	A or B
5.	Broadcast Key	❑
6.	Projector	003

Figure 3.15. Communications Menu

Baud Rate

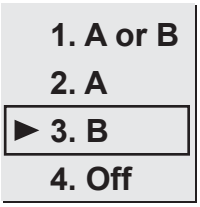
The baud rate setting determines the speed of communications to and from the projector. By default, the projector baud rate is set to 9600. Setting the correct speed is important when you are controlling the projector with an external device or another projector via an RS-232 or RS-422 port. You must set the projector baud rate at these ports to match the baud rate of the controlling device. If you are unsure about what baud rate to choose, refer to the documentation for the controlling device.

1. 1200
2. 2400
> 3. 9600
4. 19200
5. 38400

*NOTE: **1)** The baud rate setting does not affect the switcher port, which is always 9600 baud. **2)** See **2.9, Serial Port Connections** and **Appendix D** for more information about cable connections between devices.*

Front IR / Back IR

As described in *Section 2*, the standard IR remote keypad is capable of sending data to the projector in either one of two protocols called **A** or **B**. Likewise, the front and rear IR sensors on the projector can be set to accept IR data accordingly, responding to **A**, **B** or both. The projector's **A** or **B** default is adequate for most single-projector installations. Select a specific protocol to prevent interference when you are controlling two protectors in the same area and want to work with one projector at a time.



Note that the front and rear IR sensors cannot respond to *different* protocols-if you change a protocol for either sensor to anything other than **OFF**, the protocol for the other sensor also changes. For example, setting *Front IR* to **B** also changes the *Back* IR to **B**. If you want only *one* sensor to respond to a particular protocol-**A**, **B**, or **A** or **B**-disable the other sensor by setting its protocol to **OFF**.

If you want to disable *both* IR sensors, you cannot use the IR remote keypad to select the second **OFF** setting. This safeguard prevents accidentally disabling a keypad while you are using it. Instead, use either the built-in keypad or the wired remote to set the remaining active sensor to **OFF**. The projector will no longer respond to an IR remote keypad.

IMPORTANT
Keep at "A OR B" unless you are sure of the current IR keypad protocol.

*NOTES: **1)** The IR remote keypad for this projector is set at Runco to "Protocol A". See **2.10, Keypad Protocols and Conversion** for information about changing the keypad protocol. **2)** A key press from a conflicting protocol will cause a single yellow flash on the Status LED located in the lower right corner of the rear projector panel.*

Wired Keypad

Like the IR remote keypad, the optional wired keypad is either a "Protocol **A**" keypad (default) or a "Protocol **B**" keypad. Likewise, the projector can be set to accept wired keypad data accordingly, responding to **A** or **B**. If desired, you can prohibit the projector from responding to a particular wired keypad protocol, or you can ensure that the projector responds to either protocol (default). You can also prevent the projector from responding to the keypad entirely. In the pull-down list, select the desired protocol.

*NOTE: The wired keypad for this projector is set at manufacture to "Protocol A". See **2.10, Keypad Protocols and Conversion** for information about changing the keypad protocol.*

ADDING A PROTOCOL: To add a protocol, select the **A** or **B** option.

CHANGING A PROTOCOL: As a safeguard, you cannot accidentally select an option in the "Wired Keypad" list that would disable the wired keypad during use, since such options are automatically disabled in the list. In other words, you cannot switch to the opposite protocol or select OFF using the wired keypad. Instead, if you want to quickly change to the other protocol, you may find it more convenient to use one of the other keypads (the built-in keypad or the IR remote) to execute the protocol change for the wired keypad. The projector will now recognize only the opposing change for the wired keypad protocol. Or, if you prefer, use the wired keypad

to safely change its own protocol:

1. Select the **A** or **B** option. This will ensure that once your keypad is manually changed (see Step 2), it will still be recognized by the projector.

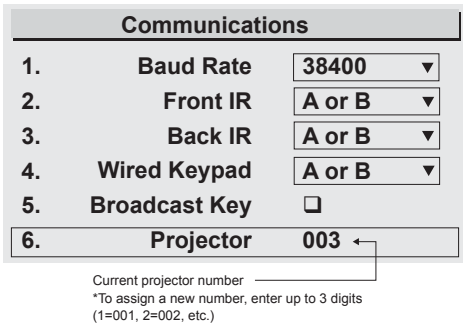
2. Unplug the keypad and change the protocol in the keypad as desired. Do this either by entering the short-cut software command or by hard-wiring the keypad as described in 2.10, *Keypad Protocols and Conversion*.

3. Plug the keypad back into the projector. Return to the *Communications* menu and select the new protocol you have just set up in the wired keypad.

TURNING OFF THE WIRED KEYPAD: If you want to disable the wired keypad entirely, you cannot use it to select the **OFF** option. This safeguard prevents you from accidentally disabling the wired keypad during use. Instead, use either the built-in keypad or the IR remote keypad to select **OFF**. The projector will no longer respond to the wired keypad.

Broadcast Keys
Enter a checkmark if you want keypad commands sent to one projector to be relayed to all projectors in a network. Note the [Proj] key will temporarily "override" the effect of a broadcast setting and allow you to control a specific projector when necessary.

Projector
Enter a three-digit number (such as "001") to assign or change a number to the projector currently in use-if the current projector already has a number assigned, that number will appear here. Numerical identity for projectors is required whenever you want to communicate with a single projector within a multiple-projector application (see [Proj] key description in 3.8, *Using the Keypad*). If you make a mistake in assigning or changing the projector number, press [Exit] to cancel.
For complete information about controlling multiple projectors, see *Section 3.8*.


Communications
1. Baud Rate 38400
2. Front IR A or B
3. Back IR A or B
4. Wired Keypad A or B
5. Broadcast Key
6. Projector 003
Current projector number
*To assign a new number, enter up to 3 digits
(1=001, 2=002, etc.)

Preferences ⏩

Use *Preferences* checkboxes and pull-down lists to alter how the projector responds to commands and displays its parameters. Refer to the "*Using Slidebars and Other Controls*" subsection if you need help. Changes made to the *Preferences* menu will be saved when you exit the menu.

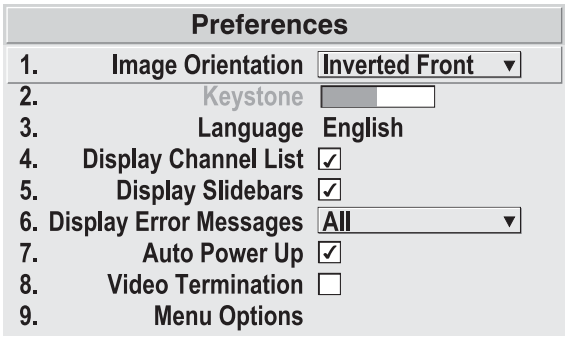


Figure 3.16. Preferences Menu

Image Orientation
Choose from Front, Rear, Inverted Front, Inverted Rear according to your installation. If the setting is incorrect, the image will be reversed and/or upside down. See **2.6, Operating Orientation** for an illustrated explanation.

Keystone
Non-functional in this version of software.

Language
This projector displays menu and help text in English only.

Display Channel List
Enter a checkmark if you want to see a scrollable channel list whenever you press [Chan] from your presentation (note that each channel to be included in the list must also be tagged in the "In Menu" checkbox in the *Channel Setup* menu). This option also enables on-screen feedback when using the [Input] key. If you prefer to hide the channel list and input dialog box while switching channels and sources during a presentation, do not enter a checkmark.

NOTE: The Channel List and input dialog box cannot be hidden when a menu is displayed.

Display Slidebars
Enter a checkmark to superimpose a small slidebar over the current image when an adjustable parameter is selected directly with a key (the option does not affect slidebars in menus). These "direct" slidebars include volume, contrast, brightness, position, pixel tracking and phase, and others. If "Display Slidebars" is unchecked, these slidebars will be hidden during adjustment.

Display Error Messages
Choose in what way you want to be notified of errors detected in either the incoming signal or projector. Select "Screen" or "All" if you want a brief message displayed. If you prefer to be notified via a serial communication only (RS-232 or RS-422), select "RS232" instead. To disable error messages entirely (except invalid user entries), select "Off".

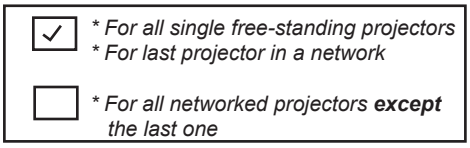
NOTE: Display of invalid user entries cannot be disabled, even if you choose the "Off" option.

Auto Power Up

Enter a checkmark to enable the projector to automatically power up after losing power due to unplugging or a power failure. Note that unsaved display adjustments may be lost.

Video Termination

Enter a checkmark to terminate the video inputs 3 and 4 (75 W). The input should be terminated unless the signal loops through (continues) to another projector or display device, in which case only the last projector in the chain should be terminated.


* For all single free-standing projectors
* For last projector in a network
* For all networked projectors **except** the last one

Menu Options

In this submenu, choose the default location desired for on-screen menus. You can use the shift options to move a location up or down, creating a Custom location. Note that menus for this projector often expand and can be quite large-avoid placing them too low or too far to the right where they may be cropped.

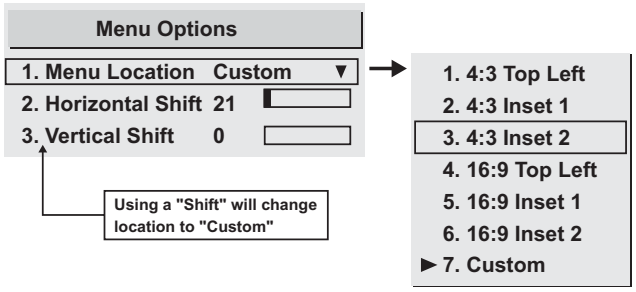

Menu Options
1. Menu Location Custom
2. Horizontal Shift 21
3. Vertical Shift 0
Using a "Shift" will change location to "Custom"
1. 4:3 Top Left
2. 4:3 Inset 1
3. 4:3 Inset 2
4. 16:9 Top Left
5. 16:9 Inset 1
6. 16:9 Inset 2
► 7. Custom

Figure 3.18. Submenu for Menu Options

Advanced Controls ⏩

The Advanced menu includes a variety of special options that an experienced operator may want to adjust for certain applications, such as color-critical displays or multiple projector walls. In addition, this menu provides access to test patterns, lamp settings and service, and the password-protected Service submenu.

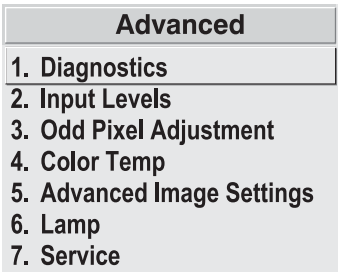
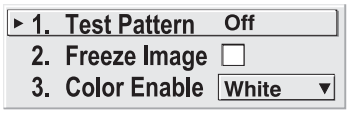


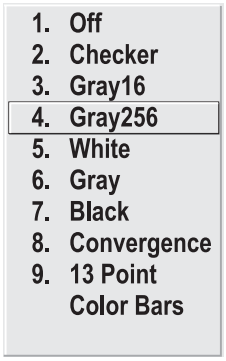
Figure 3.18. Advanced Menu

Diagnostics

Use the "Diagnostics" submenu to select a test pattern or to freeze the current image, both helpful for closely examining performance. You can also turn specific colors on or off to further pinpoint where a suspected problem may be occurring.



TEST PATTERNS - Select this option to use a pull-down list of all available internal test patterns.



NOTE: For quicker access from your presentation, use the Test *key to cycle through the patterns. At the last pattern, press* Test *to return to your presentation-or press* Exit *at any time.*

FREEZE IMAGE - Use the "Freeze Image" checkbox to freeze (stop) the image at a single frame. This diagnostic tool is useful if you need to examine in detail a still version of the incoming image that may not be "freezable" at the source. For example, in moving images it is difficult to observe artifacts such as external deinterlacing/resizing and signal noise.

COLOR ENABLE - Select which color or colors you want to see, useful while working with color temperature white levels or input levels.

Input Levels

*NOTES: **1)** It is recommended that only experienced users use the **Input Levels** menu-the projector automatically optimizes input levels for all but the most unusual of sources. **2)** Always check that overall contrast and brightness settings are near 50 **and** that color temperature is properly set up on an internal grayscale test pattern before attempting an input level adjustment. **3)** There must be at least one white pixel present in the image for "Auto" to work.*

Good RGB or input levels-that is, the *drives* and *blacklevels* for each of the three colors, red, green and blue-ensure that images from analog sources other than decoded video have maximum contrast without crushing black or white. By default (and in an "Auto Setup" from the *Main* menu), the projector automatically determines the best input levels by monitoring image content and adjusting the controls appropriately-further adjustment is typically not required to obtain proper blacks or whites. *NOTE: This automatic adjustment requires at least **1 white pixel** in the image. Without a white pixel, input levels may produce skewed colors, particularly in non-video images.*

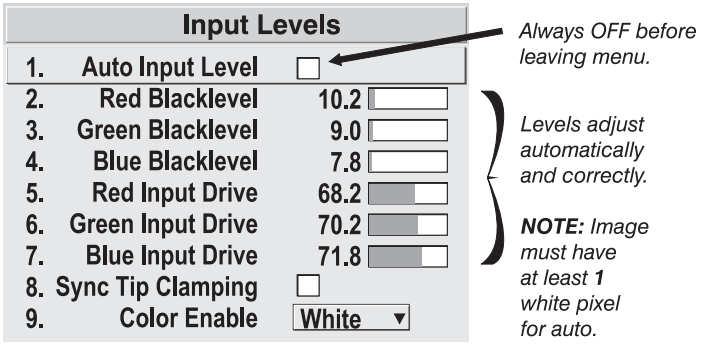

Input Levels
1. Auto Input Level
2. Red Blacklevel 10.2
3. Green Blacklevel 9.0
4. Blue Blacklevel 7.8
5. Red Input Drive 68.2
6. Green Input Drive 70.2
7. Blue Input Drive 71.8
8. Sync Tip Clamping
9. Color Enable White
Always OFF before leaving menu.
Levels adjust automatically and correctly.
NOTE: Image must have at least 1 white pixel for auto.

Figure 3.20. Input Levels Submenu

However, for a very unusual source an experienced user may prefer to use the *Input Levels* menu (see Figure 3.19). This adjustment, which is actually a calibration process to compensate for differences in sources and cabling, enables an experienced user to perfect the source image input levels.

AUTO INPUT LEVEL - Keep off for virtually all sources (default). Temporarily enter a checkmark *only* if you are an experienced user and you have an unusual source that you feel needs further color temperature and/or input level adjustment. After entering a checkmark, wait for the six values to stabilize, then delete the checkmark.

BLACKLEVELS AND DRIVES - To check your image and adjust these controls:

1. Make sure overall Contrast and Brightness are both set to near 50. *NOTE: Not required for "Auto" adjustment.*
   - Cont = 50 (approx.)
   - Brite = 50 (approx.)

2. Check the color temperature setup using an internal grayscale test pattern, adjusting as desired to obtain a neutral grayscale. *NOTE: Not required for "Auto" adjustment.*

3. Make sure you are using an analog source not connected to **INPUT 3** or **INPUT 4**, as Input Levels are not applicable for digital sources or sources going through the decoder. A grayscale is recommended.

4. If the blacks and/or whites appear OK, input levels do not need adjustment. If the image has poor blacks and/or white, continue with Step 5.

5. Temporarily enable "Auto" in the *Input Levels* submenu. Wait for all 6 values to stabilize.

6. Delete the "Auto" checkmark and leave the *Input Levels* menu.

To adjust black levels and drives manually, judge by eye and change one or more of the six levels as necessary to obtain proper blacks and whites. You may want to see only a certain color while adjusting-use the "Color Enable" option (described below).

CLAMP TIP - This option (full name *sync tip clamping*) can brighten the image produced from certain high resolution, high frequency graphic sources. Enter a checkmark if the image appears unusually dim, if there are horizontal streaks across the image, or if there is significant color drift. Delete the checkmark if the image is either sufficiently bright or overly bright.

NOTE: The sync tip clamping option is not used for video sources or any RGB source with sync information on the video (e.g., sync-on-green).

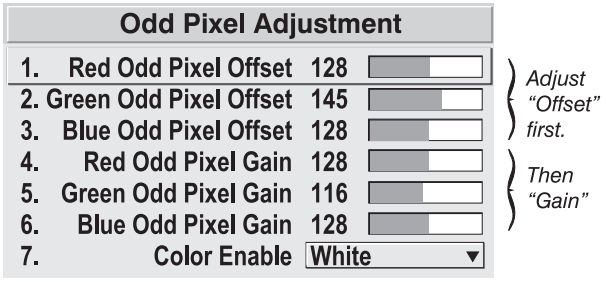
COLOR ENABLE - Select which color or colors you want to see, useful while working with color temperature white levels or input levels.

*NOTES: **1)** Input levels apply for the current source only, but for any color temperature used. **2)** Assuming that color temperature has been set up based on the internal test patterns, you can then set up input levels for a given source so that it matches the color temperature of the internal test patterns.*

Odd Pixel Adjustment

NOTE: For sources with Color Space set to RGB only.

When using certain RGB sources with static images, you may need to adjust the normal gain or offset of odd pixels in relation to even in order to smooth out very narrow (1-pixel wide) checks or vertical stripes. These patterns signify adjacent "on" and "off" pixels, and can be removed as follows:


Odd Pixel Adjustment
1. Red Odd Pixel Offset 128
2. Green Odd Pixel Offset 145
3. Blue Odd Pixel Offset 128
4. Red Odd Pixel Gain 128
5. Green Odd Pixel Gain 116
6. Blue Odd Pixel Gain 128
7. Color Enable White
Adjust "Offset" first.
Then "Gain"

1. Use an external grayscale test pattern of some kind (make sure it has both dark grays and light grays).
2. Make sure the image is displayed in its native resolution, i.e. with ***No Resizing***.
3. Display a single color - choose through the "Color Enable" menu option or use the Func key shortcuts shown on the back of the remote keypad.
4. Examine an area of ***darkest*** gray (but not black). If there is a 1-pixel wide pattern present, adjust "Odd Pixel Adjustment" ***offset*** for the current color. Stop when the pattern disappears and the area is smooth.
5. Examine an area of ***lightest*** gray (but not white). If there is a 1-pixel wide pattern present, adjust "Odd Pixel Adjustment" ***gain*** for the current color. Stop when the pattern disappears and the area is smooth.
6. Repeat for each color, adjusting offset then gain for each.

NOTES: 1) Always adjust offset before gain, since offset affects gain. 2) A value of 128 represents no change in normal odd pixel offset or gain. 3) Odd Pixel Adjustment eliminates "1 pixel on, 1 pixel off" patterns only, not any type of larger patterns.

Advanced Color Temperature

Select the *Advanced* "Color Temp" option if you want to apply, alter, add, or copy a color temperature, or if you want to use an unaltered factory default color temperature.

By default, the projector can utilize any of four calibrated factory-set color temperatures: 3200, 5400, 6500 or 9300 (expressed in degrees Kelvin). For most applications, these temperatures will display accurate and realistic colors from a variety of sources. They can be selected at any time in either the *Image Settings* menu or in the *Advanced Color Temperature* menu.

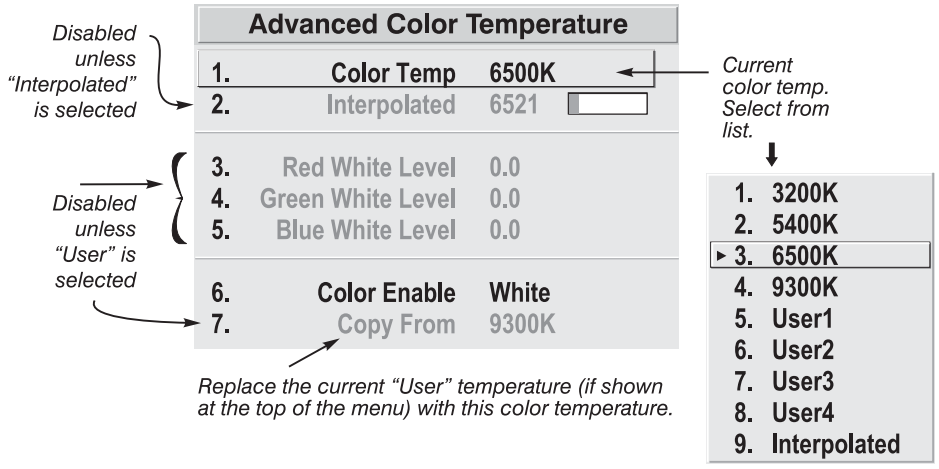

Advanced Color Temperature
1. Color Temp 6500K
2. Interpolated 6521
3. Red White Level 0.0
4. Green White Level 0.0
5. Blue White Level 0.0
6. Color Enable White
7. Copy From 9300K
Disabled unless "Interpolated" is selected
Disabled unless "User" is selected
Current color temp. Select from list.
Replace the current "User" temperature (if shown at the top of the menu) with this color temperature.
1. 3200K
2. 5400K
3. 6500K
4. 9300K
5. User1
6. User2
7. User3
8. User4
9. Interpolated

Figure 3.20. Advanced Color Temperature Menu

However, if you require extra color temperatures, you can also add up to five custom color temperatures-four "User" and one "Interpolated"-by defining them within the *Advanced Color Temperature* menu (each defaults to 6500K until then). Any "User" or "Interpolated" temperature created here is immediately applied, or it can be selected at any time from the Image Settings menu as usual, regardless of your source or channel. The *Advanced Color Temperature* menu options are described below.
NOTE: For best results, use an internal grayscale test pattern when working with color temperature.

COLOR TEMP - See Figure 3.20. Upon opening the *Advanced Color Temperature* menu, the current temperature appears as the top option. You can change to a different color temperature here as desired, just as in the *Image Settings* menu. Note that if you select a "User" color temperature, the "White Level" options further down in the *Advanced Color Temperature* menu are no longer disabled-you can adjust them as desired to define or change a "User" color temperature (see "White Levels", below). Likewise, selecting "Interpolated" here activates the "Interpolated" slidebar for defining or changing an interpolated color temperature.

INTERPOLATED - Select this option if you need a specific color temperature that lies somewhere between one preset color temperature and another. Adjust the slidebar to define a new temperature that will be interpolated from the neighboring presets (for example, 7841 is interpolated from 6500 and 9300). It can be used any time and appears as a 4-digit temperature when present.

WHITE LEVELS -These 3 controls are adjustable only if a "User" choice is selected (in which case "User 1, 2, 3 or 4" appears at the top of the *Advanced Color Temperatur*e menu). Their current values are shown for the active color temperature. Changing a white level here changes the drive (contrast) for that color, essentially creating a new color temperature that is "warmer" or "cooler" etc. When you are satisfied with the new "User" temperature, it can be used immediately upon exit or it can be selected from either the *Image Settings* menu or the *Advanced Color Temperature* menu as usual. You can re-define a "User" color temperature at any time using the *Advanced Color Temperature* menu.

COLOR ENABLE - Select which color or colors you want to see, useful while working with color temperature white levels.

COPY FROM - Use this option to replace the currently selected "User" color temperature setup with that of another. This function can be particularly useful for creating a starting point for a new "User" color or for accessing an unaltered factory default. It is disabled for all color temperatures *except* "User". See Figure 3.21.

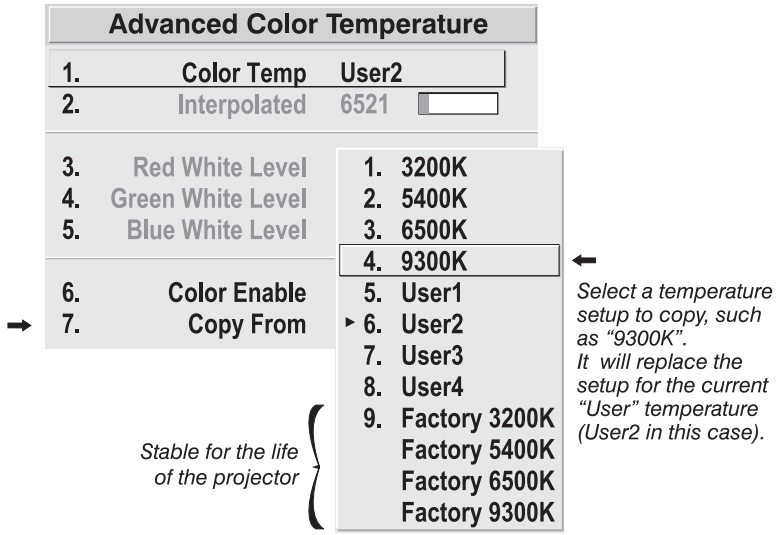
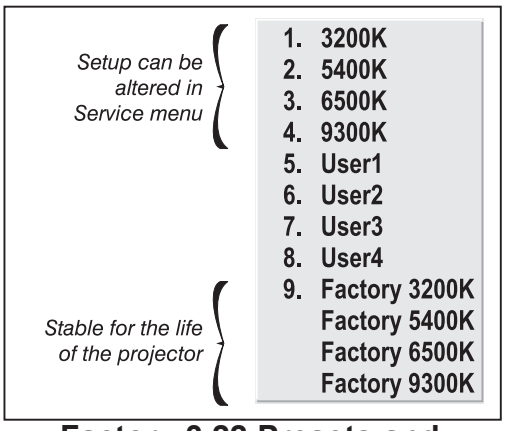


Figure 3.21. "Copy From"

***To create a starting point*:** To set a starting point for a new custom user color temperature, select a user temperature, then highlight "Copy From" and select a temperature that is similar to what you want. Adjust white levels from there as desired.

***To use a factory default*:** The preset color temperature setups (3200K, 5400K, 6500K and 9300K) can be altered from within the password-protected Service menu only-note that although such an alteration changes the *setup and appearance* for a preset, it does not change its *name*. If you suspect that you are using a preset temperature that has been altered and you want instead to use the original calibrated factory color temperature without clearing the entire projector memory, you can use the "Copy From" option in the *Advanced Color Temperature* menu to set up a "User" temperature with settings from a permanent factory preset:

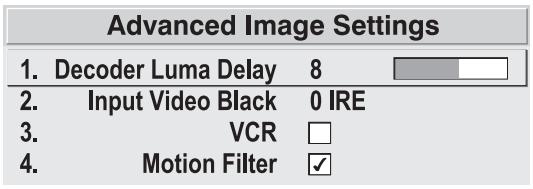


Factory 3.22 Presets and "Factory"presets

1. Enter the "User" color temperature you wish to update at the top of the *Advanced Color Temperature* menu, such as "User 2".
2. From the "Copy From" list, select the matching temperature labeled "Factory" (such as "Factory 5400K").
3 The setups for the "User" color temperature you entered at the top of the *Advanced Color Temperature* menu will now be updated/replaced by those for the permanent factory calibrated temperature you selected in the "Copy From" list. Again, a "User" temperature can be altered at any time, if desired.

Advanced Image Settings

DECODER LUMA DELAY - This option affects any incoming composite or S-video signal, delaying the luma signal (intensity) in relation to the chroma (color). In the image, increasing the luma delay will move luma (seen as a shadow where colors overlap) to the right slightly, with colors remaining in place. Decreasing this delay will move the shadow slightly to the left. If necessary, adjust so that no shadows occur with adjacent colors.



INPUT VIDEO BLACK - This option determines where black levels are determined in relation to the clamping location on a video signal, so that blacks are neither crushed (i.e., with dark gray appearing black) nor elevated (i.e., with black appearing dark gray). If black is crushed in the current image, set to "0 IRE" so that blacks are at the clamping level. If black is elevated, set to "7.5 IRE" so that blacks are set above the clamping level.

VCR - This option determines to what degree the projector tolerates signal disturbances. The correct setting is automatically determined and set according to the type of incoming source signal-for instance, there should be a checkmark for all VCR sources. The VCR option may require a change from its auto setting in very rare circumstances only, such as if you are having difficulty switching between two unusual and almost identical VGA computer sources. Otherwise, it is not necessary to change this option.

MOTION FILTER - This option is most useful for smoothing out de-interlacing artifacts that sometimes occur with moving interlaced images (such as HDTV). By default, the correct setting is automatically determined according to the type of incoming source signal. If desired, override the default setting as follows:

1. Turn to **OFF** (delete the checkmark) if you have a static image.
2. Turn to **ON** (enter a checkmark) if your moving image exhibits motion artifacts. The image will be smoother while forfeiting some sharpness.

Lamp

Whenever you install a new lamp in the projector you need to access the Lamp submenu and record the lamp serial number in the projector's memory. You can also set different Lamp submenu options such as intensity (output) or power required. These setups can be changed at any time.

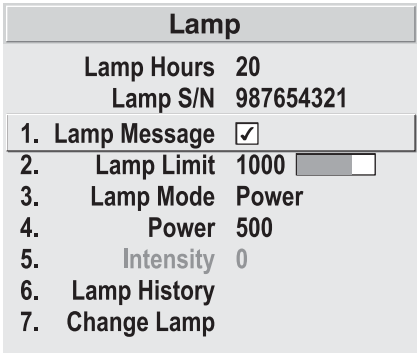


Figure 3.23. Lamp Submenu

*NOTE: See **4.4, Replacing the Lamp and Filter** for complete instructions on installing a new lamp in the projector.*

From the Advanced menu, select the "Lamp" option for access to the *Lamp* submenu, where all lamp functions and data appear. Read-only information includes the number of hours logged on the lamp so far and the serial number recorded for the installed lamp.

LAMP HOURS shows the number of hours logged on the current lamp. Whenever you record a new lamp serial number, this value automatically resets to "0", where it begins to log time for the new lamp. ***NOTE: Read-only***. This information also appears in the *Status* menu.

LAMP S/N is the serial number recorded for the current lamp. When you install a new lamp and enter its serial number, the number will appear here in the *Lamp* menu. *NOTE: Read-only*.

Enter a checkmark for **LAMP MESSAGE** if you want to enable a warning message upon power-up that the lamp has reached the specified lamp limit and should be replaced. Delete the checkmark if you do not want to see this warning-instead, when your lamp expires, only the status information on the back of the projector will provide the warning to replace the lamp.

*NOTES: **1)** It is recommended that the Lamp Message checkbox remain enabled. **2)** When a lamp warning message appears, press to temporarily cancel the message. The message will continue to appear upon power-up until you install a new lamp.*

Set **LAMP LIMIT** to the number of hours you expect to log on the current lamp before replacing it. The recommended limit is 1000 hours.

NOTE: **1)** If you change modes over the life of a lamp, the lamp limit you originally expected may no longer be possible. **2)** Turning the lamp on and off reduces lamp life significantly, as do other factors.

Set which **LAMP MODE** you want to use in order to control the light output. Although there are exceptions, in most lamps, the higher the light output or power setting, the shorter the life span of the lamp.

Figure 3.24

Use the lamp mode that best suits your brightness needs. For example, in a tiled application you may want to precisely match brightness levels between adjacent images-choose Intensity for each projector, then judge by eye and set each individual intensity setting as necessary (see "**Intensity**", below). Or you may simply always need as much brightness as possible-choose **Max Brightness**.

Lamp modes are described below:

- **Max Brightness**: The lamp will always burn as brightly as possible, driven by maximum power of 700W. Keep in mind that the "maximum brightness" for any lamp gradually diminishes with age-the image will become dimmer over time. Its current output level appears in the "**Intensity**" option (not in lumens).

- **Intensity:** Brightness will remain at a specified level for as long as possible. Once you select this option, enter a number representing the intensity level (brightness) you wish to maintain. Note this value is a correlation only (0-9999), not actual lumen levels possible (0-3000, e.g.). See "Intensity" below.

- **Power**: The power supplied to the lamp will remain at a desired watt level throughout the life of the lamp. Once you select this option, enter the number of watts representing the

power level you wish to maintain. See "**Power**" below.

POWER - The number shown here indicates how many watts are applied to the lamp. Set from 450-700 watts as desired, keeping in mind that lower power levels produce dimmer images. When in "**Power**" or **Max Brightness** modes, the power level remains constant. When in "**Intensity**" mode, the power level will change as necessary. Specifying a power level of 700 is the same as operating in **Max Brightness** mode.

*NOTES: **1)** Power level can be set only if the lamp is in "power" mode. **2)** If you are in "Intensity" mode, the power level value will automatically increase over time as necessary to maintain the desired brightness, until power reaches 700W.*

INTENSITY - This number is a representation of the current brightness of your lamp, decreasing over time when you are operating at **Max Brightness** or at a specific **Power** level. However, when you are operating in "**Intensity**" mode, this value remains at the original "**Intensity**" setting chosen.

NOTE: The number shown for "intensity" is not the actual lumen output, but rather a correlated value only-9999 may represent 3000 lumens, for example.

To use "**Intensity**" mode, judge by eye and set the level as desired for your application, remembering that higher settings can significantly shorten lamp life. Over time, the projector will automatically increase the power supplied to the lamp as needed to maintain the chosen intensity to within 5% of the setting. This is called "brightness tracking".

Keep in mind that once the lamp power has reached its *maximum* of 700 watts (see "**Power**", above), this tracking is no longer possible. At this point, the lamp will gradually begin to dim as usual, even though your original "**Intensity**" value will still appear in the menu. To resume accurate tracking, reduce the intensity setting so that the resulting "**Power**" value is under 700 watts - the lower the intensity, the longer it can be maintained.

Do not lower the "**Intensity**" so much that the corresponding "**Power**" value reaches its minimum of 450 watts - the intensity setting will be inaccurate and cannot be maintained. For matching intensity over in tiled images, choose an intensity setting that enables all lamps to operate at less than 700 watts.

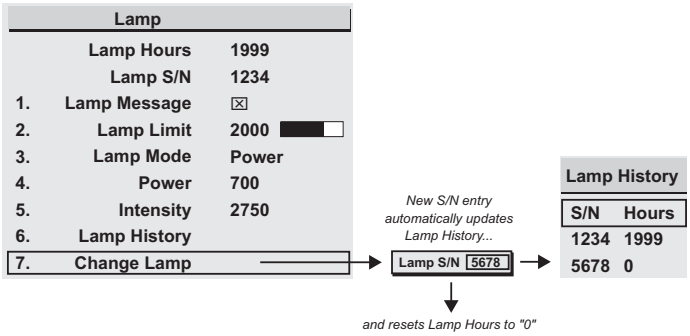
NOTES: 1) Lamps become more stable over time, thus a specific intensity is more easily maintained as the lamp ages 2) Intensity can be set only if the lamp is in "Intensity" mode 3) Intensity cannot exceed the output of Max Brightness mode.

LAMP HISTORY - This read-only option lists the most lamps most recently installed and recorded in the projector. Lamp History automatically updates whenever you record a new lamp serial number-the new lamp is added to the bottom of the list.

Lamp History

S/N	Hours
1234	1999
5678	27

Use **CHANGE LAMP** to record the serial number for a newly installed lamp.



In the *Lamp S/N* window, use the number text entry keys to record the new lamp serial number, and press Enter again to accept the change. See *Using Slidebars and Other Controls* if you need help entering the number. Once entered, the new lamp serial number will be added to the *Lamp History* menu and the *Lamp Hours* timer will reset to "0". *Lamp Mode* and *Lamp Limit* remain as they were for the previous lamp, and can be changed at any time.

*NOTE: Enter a serial number **only** if you have just installed a new lamp. This will help ensure that lamp timer is not reset on an old lamp and that the number of hours logged on the lamp will be accurate.*

⚠ IMPORTANT ⚠
Always record the serial number of a NEW lamp.

Service
The *Service* submenu is also accessed through the *Advanced* menu, but it is password-protected and intended for use by qualified service technicians only.

Status ⏩
This read-only menu lists a variety of details about the standard and optional components currently in use on the projector. Refer to the *Status* menu for versions of hardware (left side) and software (right side) installed, the number of lamp hours logged in total and for a specific period (such as a rental period), and for your projector model name and serial number. In addition, the Status menu identifies the current channel, switcher, slot and frequencies.
Use ▲ON , ▼OFF , ◄ – or + ► to see additional *Status* information.

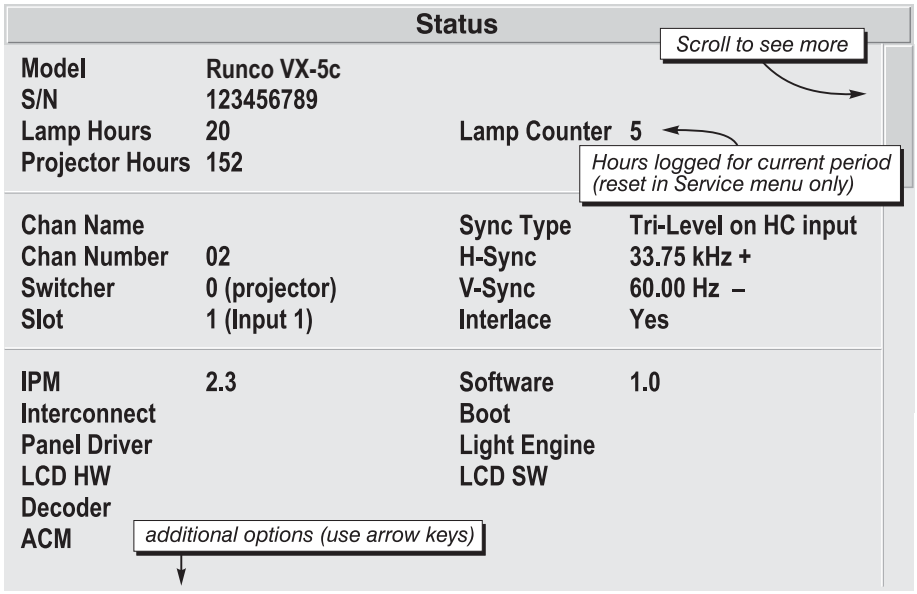


Figure 3.26. Status Menu (SAMPLE)

3.8 Using Multiple Projectors

When working with multiple projectors, you may want to use the RS-232 or RS-422 serial ports to chain the projectors together in a network that you control from either a keypad or a computer/controller (*see 2.9, Serial Port Connections*). Or you may prefer that each projector stands alone, in which case you will probably use a single IR remote keypad. In either case, you can switch back and forth between broadcasting to all projectors or controlling each projector individually.

Assigning a "Projector#" ⏩

Make sure you have assigned a unique projector number to each projector present - this number will be required in order get the exclusive attention of an individual projector. To assign a projector number:

Press [Menu] and select the Communications menu. In the Communications menu, scroll down to "Projector#" and enter a three-digit number (000 to 999) for identifying the current projector.

Press [Enter] to accept the entry, or [Exit] to cancel.

Repeat for each projector, using a unique three-digit number for each. Once every projector has its own number, you can begin to control the network.

Controlling One Projector ⏩

If you are using an IR remote, press [Proj] to display an editable window. Enter the three-digit number you have assigned to the projector you wish to control. All keypad commands will then affect this projector exclusively until you press [Proj] again and enter a different number, or until you switch to broadcast mode (below).

If you are using a wired remote keypad (optional) in a network of projectors, make sure that the projector to which the keypad is connected has its "Broadcast Keys" option checked. Press to bring up the editable box. Enter the three-digit number assigned to the projector you want to control - keypad commands will now affect only the desired projector until you press [Proj] again and enter a different number, or until you switch to broadcast mode (below).

NOTES: 1) If you are using a computer or controller to issue commands, use the correct RS-232 software command to gain control of a single projector.

Broadcasting to All Projectors ⏩

On the IR remote or wired keypad, press to display the projector box. Press again without entering a number - the keypad commands will now affect all projectors.

Make certain that only one projector has its "Broadcast Keys" option selected (checked) - the remaining projectors should have the option unchecked and their keypads disabled (do this in Preferences menu). The "Broadcast Keys" projector will then relay keypad commands to the others. If using a wired remote, make sure to select the "Broadcast Keys" option for the projector to which the wired remote is connected.

NOTE: If you are using a computer or controller to issue commands, use the correct RS-232 software command to broadcast.

3.9 Error Conditions

Occasionally the projector may encounter an error condition that interrupts normal operation. Such a condition can be caused by an invalid user entry, an input signal error (most common) or other system error.

If you would like to be notified on-screen of such errors, select the "Screen" option from the "Display Error Messages" pull-down list (in *Preferences* menu). If you would like to be notified via a serial communication only, select the "RS-232" option instead. To receive both notifications, select "All". To disable error messages (except for invalid user entries), select "Off".

NOTE: Error messages also always appear at the rear LCD next to the keypad.

User Errors ⏩ Invalid User Entry

Any keypad entry not recognized by the projector will trigger an on-screen error message describing the problem. For example, if you specify a channel number that has not been defined, the message *"Invalid Channel"* will appear. Or if you try to enter the wrong password, you'll see *"Invalid Password"*. Press Enter or Exit to confirm the message and eliminate the message box.

*NOTE: Displaying of "Invalid User Entry" messages cannot be disabled, even if **Display Error Messages** has been set to "Off".*

Input Signal Errors ⏩

Input signal errors messages appear when there are no menus present, and have selected an input on which the projector detects a problem. While menus remain operational and pressing any key will temporarily remove the message from the screen, you must resolve the signal problem in order to permanently eliminate the message.

*NOTE: Input signal messages appear on-screen only if **Display Error Messages** has been set to "Screen" or "All".*

No Signal

The message *"No signal"* appears when there is no signal detected at the selected input. Both HSYNC and VSYNC are inactive and the screen background is black. Connect or correct the signal, or select another input.

Bad Sync

The message "Bad Sync" is displayed when HSYNC or VSYNC are active but the signal cannot be displayed. Such a condition occurs when only one of the two signals is present, or when either signal is unstable or of the wrong frequency. Correct the signal or select another input.

Other Signal Error Messages

In addition to the common *"Bad Sync"* and *"No Signal"* errors, you may encounter a signal error message indicating that Hsync and/or Vsync are either too fast or too slow. When such a message appears, check the frequencies shown in the Status menu. If they are correct, then the signal may be out of the projector's operating range. On some PCs you may be able to change the settings to generate a compatible signal. If the frequencies shown in the Status menu are incorrect, check the cabling to see where the problem is.

System Warnings / Errors ⏩

When the projector encounters a system malfunction, either a System Warning message or a System Error message may appear. Both types of messages are accompanied by a steady red "Power" LED and a flashing red-and-yellow error code on the "Status" LED. This condition indicates the need for service by a qualified Runco service technician.

*NOTE: System messages appear on-screen only if **Display Error Messages** has been set to "Screen" or "All".*

System Warnings

A system *warning* message indicates that a system malfunction has been detected (see *Status LED Codes,* below). A system warning message replaces any input signal message and disappears when the input signal status changes. While the projector will remain operational, the message indicates the presence of a serious problem that should be reported to the manufacturer. You can press [Exit] to remove the message, but for best results you should reset the projector-power the projector down and up again with the [Power] key.

System Errors

A system *error* message indicates that a serious malfunction has been detected and must be reported to the manufacturer (see *Status LED Codes,* below). The projector will no longer operate and must be reset-power the projector down and up again with the [Power] key.

The Status LED Codes

If the "Status" LED on the back of the projector repeatedly flashes a pattern of yellow and red light while the "Power" LED glows a continuous red, you have encountered a likely system error requiring the attention of a qualified service technician (see *System Warnings and System Errors,* above). Try resetting the projector by powering it off and on again, cooling when necessary. Consult Table 1 and contact your Runco dealer if the problem persists.

The specific pattern of flashing indicates the 2-digit code identifying the type of problem encountered-the number of yellow flashes represents the first digit and the number of red flashes indicates the second digit. For example, a pattern of "yellow-yellow-red-red-red" is "Code 23", meaning the lamp ballast (power supply) is overheated. These codes include:

Table 1. System Error Codes

Code	Description
GENERAL	
12	Software bug
13	CRC error in flash ROM
14	Programming complete
15	Attempting to download code without being in boot mode
16	Invalid interrupt
LAMP / BALLAST	
21	Unable to turn the lamp on
22	Lamp is overheated
23	Lamp ballast (power supply) is overheated
24	One or more of the lamp interlocks are open
25	Lamp may be on before being turned on
26	Invalid lamp ballast ID
27	Unexpected lamp shut-off
IMAGE PROCESSOR MODULE	
31	Boot code CRC failed
32	Unable to program the Sync Xilinx part
33	Unable to program a device on Altera programming bus
34	Unable to program a device on JTAG programming bus
35	Unrecognized ROM type
36	Write to flash ROM failed
37	General IPM failure
38	Code being downloaded will not fit in ROMs
PANEL DRIVER MODULE / LIGHT ENGINE ELECTRONICS	
41	Unrecognized Panel Driver Module (PDM)
42	Unable to program a device on Panel Driver programming bus
43	Panel Driver/light engine communication problem
44	Red Formatter/flex cable problem
45	Green Formatter/flex cable problem
46	Blue Formatter/flex cable problem
POWER & COOLING	
51	Fan #1 failed (part of Cooling Module)
52	Fan #2 failed (part of Cooling Module)
53	Fan #3 failed (side fan, rear—connects to J38 on ICM)
54	Fan #4 failed (side fan, front—connects to J39 on ICM)
55	Low voltage power supply failed to turn on
MOTOR CONTROL MODULE (not in the VX-3b)	
61	Problem communicating with MCM
INTERCONNECT OR CHASSIS I.D.	
71	Unable to access EEPROM on the ICM
72	EEPROM memory has re-initialized
VIDEO DECODER MODULE (INPUT 3 OR 4)	
81	Unable to program the video decoder (VDM)
OPTIONAL INTERFACE MODULE	
91	Unable to program the option card

If you encounter a system error, try resetting the projector by powering it off and on again (cooling if necessary).

Maintenance

4.1 Warnings and Guidelines

This projector is CSA approved and is designed for safe and reliable operation. However, safe operation cannot be assured by design alone; installers, maintainers, and users must maintain a safe operating environment for the system. Please read through and understand the following warnings and guidelines promoting safe usage of the projector.

⚠ WARNING ⚠
Never look directly into the projector lens.
The extremely high brightness of this projector
can cause permanent eye damage.

⚠ WARNING ⚠
For protection from ultraviolet radiation,
keep all projector shielding intact during operation.

Labels and Markings ⏩

Observe and follow all warnings and instructions marked on the projector.

The exclamation point within the equilateral triangle alerts the user to important operating and maintenance (servicing) instructions in the literature accompanying the projector.

The lightning flash and arrowhead symbol within the equilateral triangle alerts the user to non-insulated "dangerous voltage" within the projector's enclosure that may be of sufficient magnitude to constitute a risk of electric shock.

Projector Location ⏩

Operate the projector in an environment that meets the operating range specifications in *Section 5, Specifications*. Do not operate the projector close to water, such as near a swimming pool.

Do not place the projector on an unstable cart, stand or table. If the projector is to be ceiling mounted, only use a Runco-approved ceiling mount fixture.

A projector and cart combination should be used with care. Sudden stops, excessive force, and uneven surfaces may cause the projector and cart combination to over-turn.

MAINTENANCE

Lamp and Filter Replacement ⏩

LAMP: Do not operate the Xenon lamp for more than 1000 hours; risk of the lamp shattering increases as a result of changes in the quartz glass. Also, operation beyond 1000 hours significantly reduces brightness output.

⚠ WARNING ⚠
Never attempt to remove the lamp housing directly after use.
The lamp is under great pressure when hot and may explode,
causing personal injury and/or property damage.
Allow to cool completely.

The arc lamp operates at a very high temperature and pressure. Failure to allow the lamp to sufficiently cool prior to handling could result in an explosion causing personal injury and/or property damage. After turning the projector off it is important that you wait at least five minutes before unplugging it. This provides enough time for the internal lamp cooling fans to cool the lamp and to automatically shut off. Cool completely before handling.

⚠ WARNING ⚠
Use only lamps supplied by Runco.

FILTER: Replace the side filter every 1000 hours or sooner. If this filter is not replaced, air flow may become restricted and cause the projector to overheat.

See ***4.4, Replacing the Lamp and Filter*** for the complete replacement procedure.

⚠ WARNING ⚠
Use only filters supplied by Runco.

Power Cord and Attachments ⏩

Only use attachments or accessories recommended by Runco, such as the 13 amp high-current rated power cord supplied. Use of other attachments or accessories with this projector may result in the risk of fire, shock or personal injury.

⚠ WARNING ⚠
Use only the AC power cord supplied.
Do not attempt operation if the AC supply and
cord are not within the specified voltage and power range.

Do not allow anything to rest on the power cord. Locate the projector where the cord cannot be damaged by persons walking on it or objects rolling over it.

Operate the projector at the specified voltage only. Do not overload power outlets and extension cords as this can result in fire or shock hazards. Runco recommends a dedicated AC circuit for the projector itself.

The projector is equipped with a three wire plug having a third (grounding) prong. This is a safety feature. If you are unable to insert the plug into the outlet, contact an electrician to have the outlet replaced. Do not defeat the safety purpose of the grounding-type plug.

Ventilation ⏩

Before unplugging the power cord, make sure the internal lamp cooling fans have shut off. The fans automatically shut off when the projector has adequately cooled down.

Slots and openings in the projector provide ventilation. To ensure reliable operation of the projector and to prevent overheating, these openings must never be blocked or covered. The projector should never be placed near or over a radiator or heat register. The projector should not be placed in an enclosure unless proper ventilation is provided.

Do not push objects of any kind into the projector through the ventilation openings. They may touch dangerous voltages or short-out components resulting in a fire or shock hazard. Do not spill liquids of any kind into the projector. Should an accidental spill occur, immediately unplug the projector and have it serviced by a qualified Runco service technician.

Servicing ⏩

If any of the following conditions exist, unplug the projector from the power outlet and refer service to qualified Runco service personnel.

- The power cord has been damaged.
- The internal cooling fans do not come on when the projector is first turned on.
- Liquid has been spilled into the projector.
- The projector has been exposed to excessive moisture.
- The projector does not operate normally.
- The projector has been dropped or the case has been damaged.

Do not attempt to service the projector yourself. All servicing must be performed by a qualified Runco service technician. If replacement parts are required, it is important that only Runco-approved parts are used. Other parts may result in fire, electric shock or risk of personal injury.

4.2 Cleaning

Clean the projector when required. Before cleaning, always unplug the projector from the power outlet.

Lens ⏩

To avoid the risk of scratching the lens, clean the lens *only* if absolutely required. A small amount of dust on the lens will have very little effect on picture quality. If the lens must be cleaned, use a DRY soft cotton cloth. Clean gently in a circular motion.

Lamp ⏩

It is important to never touch the glass surface of the lamp, as the oil imprint will seriously degrade lamp performance. Should you accidentally touch the surface of the lamp, clean carefully with a lint-free cloth moistened with isopropyl alcohol.

MAINTENANCE

Case ⏩

Clean the case with a soft dampened cloth. Use a mild commercial cleaner. Do not use liquid or aerosol cleaners.

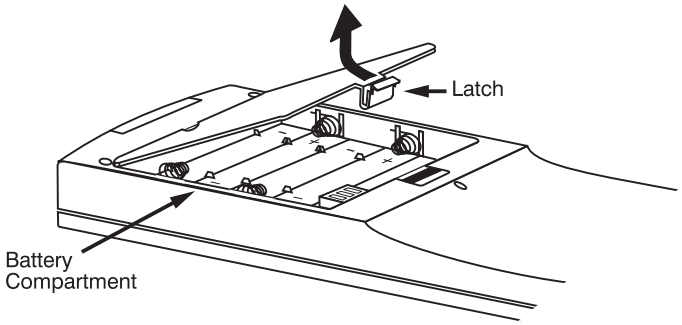


Figure 4.1. Replacing Keypad Batteries

4.3 Replacing Keypad Batteries

The optional IR Remote Keypad uses four AA size, 1.5V batteries (preferably alkaline). To install new batteries, open the battery compartment at the back side of the keypad by pulling on the raised portion of the cover as shown (Figure 4.1).

Remove the old batteries and properly discard. Wait a minute or two and place the new batteries in the compartment, orienting the positive/negative of each battery according to the labels in the compartment. When batteries are in place, replace the cover by inserting its bottom edge first and snapping the top into place. Do not force.

NOTE: Always wait a minute or two when replacing batteries so that the internal electronics discharge and can recognize the change.

NOTE: For this procedure you will need a VX-5c Lamp and Filter Replacement Kit from Runco.

The high brightness of your projector is provided by a 700 watt Xenon lamp permanently mounted inside its own protective housing. When the bulb approaches 1000 hours of usage, this lamp assembly should be replaced.

How Old is The Lamp?

The number of hours logged on the current lamp appears both in the *Lamp* submenu (accessed through the *Advanced* menu) and the *Status* menu. In the *Status* menu, do not confuse “Lamp Hours” with “Lamp Counter”, which indicates the number of hours logged during the ‘rental period’, in a situation where the VX-5c is to be rented for various functions. In a permanent install, this would be of no consequence.

*NOTE: As the lamp nears its limit (as set in **Lamp Limit**), a message can appear on screen to warn that the lamp needs to be replaced. To make sure that this warning appears, enter a checkmark in the **Lamp Message** checkbox located in the **Lamp** submenu.*

4.4 Replacing The Lens

A variety of lenses are available to accommodate different throw distances and specific types of installations. See page 5-1 for details. To change a lens, follow the steps below.

*NOTES: **1)** You will need a 9/64"(3mm or 3.5mm) hex socket ball driver (supplied with projector) or allen wrench for this procedure. **2)** "Top" or "bottom" references assume a non-inverted projector, as illustrated. 3) If you are installing a lens, first make sure its **Lens Adapter** is present on either the lens or projector. Such an adapter/flange secures to the projector in the same manner as the flange described below, but accommodates a screw-mount lens.*

STEP 1 ⏩ Turn off the projector, cool, and unplug.

Before removing or installing a lens, turn off the projector and allow it to cool for five minutes before unplugging. Make sure that the lens cap is on.

⚠ WARNING
Unplug the projector.
Install the lens cap.

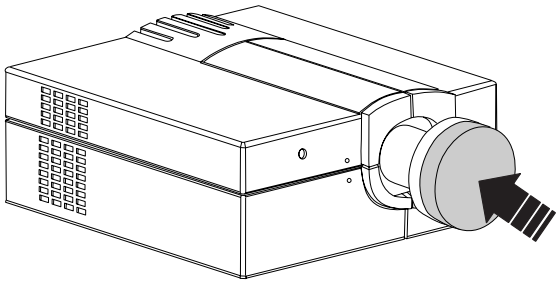


Figure 4.9. Install lens cap

STEP 2 ⏩ Loosen the 3 lens mount screws

- **IF FIXED LENS**: Use the hex socket ball driver provided with the projector to loosen the 3 lens mount screws that secure the lens flange to the mount-loosen these screws only, do not remove. See Figure 4.10.

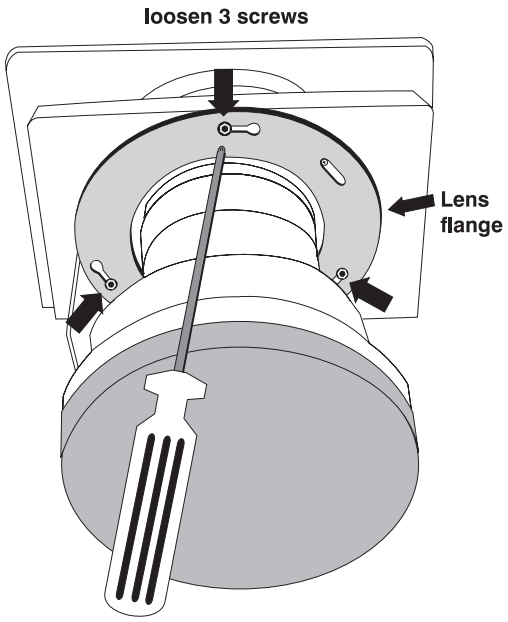


Figure 4.10. Loosen 3 screws - FIXED LENS -

●**IF ZOOM LENS**: Access to the 3 lens mount screws is likely blocked by the toothed zoom ring in front of it. First rotate the zoom ring by hand until its 3 access holes align with the screws, then insert the hex socket ball driver through the holes to loosen the screws-do not remove. See Figure 4.11.

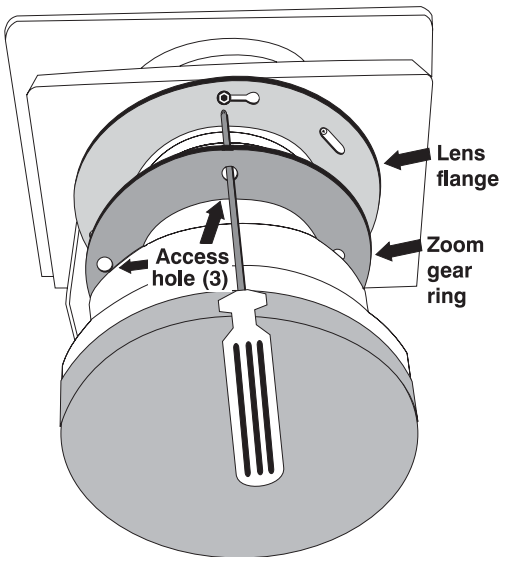


Figure 4.11. Align zoom gear ring to access 3 screws
-ZOOM LENS-

STEP 3 ⏩ Rotate the lens barrel slightly

● Using both hands, rotate the lens barrel counterclockwise until the screw heads align with the larger end of their slots on the lens. See Figure 4.12.

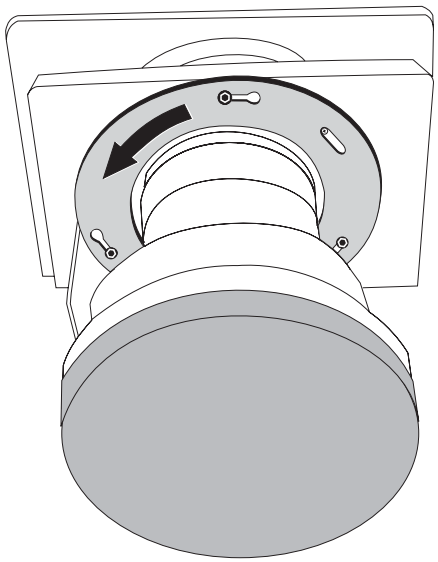


Figure 4.12. Rotate slightly

STEP 4 ⏩ Pull lens assembly out

- See Figure 4.13. Carefully pull the lens assembly straight out of the projector and set aside.

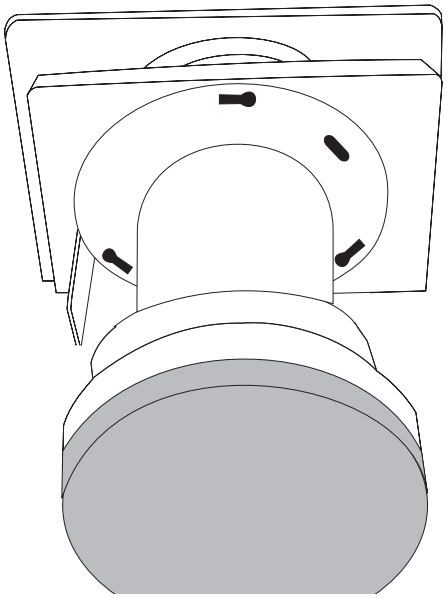


Figure 4.13. Remove lens assembly

STEP 5 ⏩ Install new lens assembly

- **IMPORTANT**: *Remove the rear (smallest) lens cap from the new lens*. Make sure the **front** lens cap remains on during installation.

- See Figure 4.14. Align the large cut-out area on the lens flange to the **bottom** of the lens mount (which has a matching cut-out). The 3 lens assembly slots should align with the lens mount screws so that the screw heads will fit through the large end of the slots.

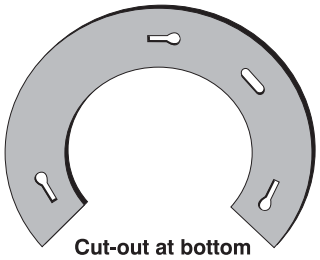


Figure 4.14. Orientation

NOTE: On most lenses, a small extra "keying" slot located at approximately 2 o'clock on the lens flange will align with a set screw in the same location on the lens mount, preventing the lens from being installed in the wrong orientation. If the lens flange does not seem to fit into place over all screws, try rotating the lens assembly in one direction or another.

- With the lens assembly aligned and the screws inserted through the flange, use both hands to rotate the lens barrel clockwise until the lens mount screw heads lock into the small end of the lens assembly slots.
- Secure the 3 lens mount screws.

STEP 6 ⏩ Reposition the projector for new lens

Remove the front lens cap and reposition the projector closer or further from the screen as necessary for the screen and the new lens type (refer to lens descriptions in *Section 2* and *Section 5* and *Appendix E*, *Throw Distance*). In a permanent installation, always use the appropriate throw distance formula to calculate the distance accurately Power up and test. Adjust offsets as necessary.

4.5 Troubleshooting

If the projector appears not to be operating properly, note the symptoms present and use the following guide to assist you. If you cannot resolve the problems yourself, contact your Runco dealer for assistance.

NOTE: Always check the LCD status window at the rear of the projector for initial information about a problem.

Symptom ⏩ The projector will not turn on when [Power*] is pressed...
CAUSE / REMEDY:

1. Make sure to hold [Power*] for approximately one second. Or press quickly and release, and follow with [▲ON] .
2. Do both LEDs come on at the rear of the projector? Check that the power cord is properly connected at the wall outlet (100-240 VAC, 50-60 Hz nominal) and that you are using the original high-current 13A cable provided.
3. Does the green "Status" LED flash with each key press? If not, the projector is not receiving the keypad's IR signals. Ensure the keypad is directed at either the front or rear of the projector, or at the screen. Also make sure that these paths are not blocked. Try the built-in keypad.
4. The batteries in the IR remote keypad may be weak. Refer to 4.3, *Replacing Keypad Batteries* for instructions.
5. The IR keypad may have been disabled by a change in protocol. See 2.10, *Keypad Protocols and Conversion* and 3.7, *Adjusting System Parameters* and .
6. Use the [Power*] key on the built-in keypad to turn the projector on.

Symptom ⏩ The projector is on but I can't see display of source input...
CAUSE / REMEDY:

1. Was the lens cover accidentally left on? Remove lens cover.
2. Is the shutter closed? Is the projector in standby? Press [Exit] to clear.
3. Is an active source connected properly? Check the cable connections. And is the correct source selected? Press [Input1] ,[Input2] , [Input3] , or [Input4] to select. *See 2.4, Source Connections* and *3.5, Working with Inputs and Channels* for details.
4. Are there test patterns or menus present? If so, check your source connections again.
5. The room lighting may be too bright. Lower the intensity of the room lighting. Reduce light reflections as much as possible.
6. Increase contrast and/or brightness of image.
7. The projector may be too far from the screen. Move the projector closer.
8. Is the "Status" LED flashing a pattern of yellow and red lights while the "Power" LED is

steady red? This indicates an internal system error that may prevent the projector from operating. If the problem persists contact a qualified Runco service technician.

Symptom ⏩ The projector does not respond to the infrared remote keypad...
CAUSE / REMEDY:

1. Does the built-in keypad work? If so, check that the keypads are enabled.
2. Does the green "Status" LED flash each time a key is pressed? If not, the projector is not receiving the keypad's IR signals. Ensure the keypad is directed to either the front or rear of the projector, or towards the screen.
3. The viewing path between the IR keypad and the projector (or screen) may be blocked. Ensure there is a clear line-of-sight between the keypad and the projector (or screen).
4. The batteries in the IR remote keypad may be weak. Refer to 4.3, Replacing Keypad Batteries for instructions on how to replace the batteries.
5. There may be unusual lighting conditions in the room affecting IR keypad operation. Determine if such conditions exist and correct.
6. The IR keypad may have been disabled for use with this projector(s). Press to enable broadcasting to all projectors. See 2.10, Keypad Protocols and Conversion and 3.7, Adjusting and Checking System Parameters for additional information.

Symptom ⏩ The power is on but the lamp is not...
CAUSE / REMEDY:

1. Does the LCD status window say "warming up"?
2. The projector probably became overheated (there is likely an error code flashing and a message in the LCD status window). Allow to cool and make sure that nothing blocks projector vents. Do not operate in environments warmer than 35°C (95°F).
3. The lamp may have reached the end of its life. Check the "Lamp Hours" via RS-232 request 'lph?'.

Symptom ⏩ The display is jittery or unstable...
CAUSE / REMEDY:

1. If the display is jittery or if it disappears and reappears erratically, check that the source is properly connected and that its signal is of adequate quality for detection. For example, it the projector scans the default input for a signal to display, and a poor quality or improperly connected source is connected, the projector will briefly and repeatedly attempt to display an image. If no source is connected, the "No signal present" error message appears over a blank display. Correct the source connection.
2. The horizontal or vertical scan frequency of the input signal may be out of range of the projector. Refer to Section 5, Specifications for scan frequency ranges.
3. The sync signal may be inadequate. Correct the source problem.
4. The input signal type may conflict with the input module. Install/use the correct module for the source.
5. Pixel tracking, phase, filter, etc. may need more adjustment.

Symptom ⏩ The display is faint...
CAUSE / REMEDY:

1. Check Input Levels option-turn auto to "off", then "on" again.
2. Brightness and/or contrast may be set too low. Adjust as necessary.
3. Gamma may be set too low. Recommended setting for most signals is 2.2.
4. The projection room may be too bright. Lower the intensity of projection room lighting and reduce light reflections as much as possible.
5. The projector may be too far from the screen. Move the projector closer.

6. The location of the audience with respect to the screen may not be ideal. Make sure the audience is within the viewing angle set by the projector and screen position, and the screen type.
7. The source may be double terminated. Ensure the source is terminated only once.
8. The source (if non-video) may need sync tip clamping. Enter a check in the "Clamp Tip" box found in the *Input Levels* submenu.

Symptom ⏩ The display is reversed and/or upside-down…
CAUSE / REMEDY:

1. The projector's image orientation is not set correctly for the current installation. Refer to *2.6, Operating Orientation* to set the projector's image orientation to match your installation.

Symptom ⏩ The upper portion of the display is waving, tearing or jittering…
CAUSE / REMEDY:

1. This can sometimes occur with video or VCR sources. If you are using a VCR, make sure that the "VCR" option is checked (in *Advanced* menu).

Symptom ⏩ Portions of the display are cut off or wrap to the opposite edge…
CAUSE / REMEDY:

1. Reduce top, bottom, left or right blanking from within the *Size and Positio*n menu. Check size and position adjustments.
2. Resizing may need adjustment. Adjust until entire image is visible and centered.

Symptom ⏩ The display appears compressed or stretched…
CAUSE / REMEDY:

1. The frequency of the pixel sampling clock is incorrect for the current source.
2. The *Size and Positio*n options may be adjusted poorly for the incoming source signal. See *3.6, Adjusting the Image.*

Symptom ⏩ Display quality appears to drift from good to bad, bad to good…
CAUSE / REMEDY:

1. The operating temperature of the projector may be fluctuating. Watch that the projector is not located too close to heating/air conditioning vents.
2. The source input signal may be of low quality.
3. The horizontal or vertical frequency of the input may have changed at the source end.

Symptom ⏩ The display has suddenly frozen, or an unknown menu has appeared…
CAUSE / REMEDY:

1. You may have accidentally entered a special engineering code using the Func key in combination with certain numbers, or you may have selected the "Freeze Image" option. Press Exit as necessary to cancel the function and return to presentation level.
2. If the screen blacks out inexplicably, it is possible that excessive voltage noise on the AC or ground input has interrupted the projector's ability to lock on to a signal. Turn the projector off, wait for the lamp fans to stop, and unplug. Plug in again and power up as usual.

Symptom ⏩ The display is not sharp or "clean"…
CAUSE / REMEDY:

1. More display adjustment may be required-focus, brightness, contrast, pixel tracking, pixel phase, and detail.
2. If you are using a BNC T-connector, try using a distribution amplifier to boost signal levels.
3. Is the video input signal properly terminated? Set in *Preferences* menu.
4. The screen size may be too large. As screen size increases, magnification increases, reducing brightness and clarity. See lens specifications in *Section 5*.
5. The source input signal may be of low quality. Try another source.

Symptom ⏩ Colors in the display are inaccurate…
CAUSE / REMEDY:

1. The color, tint, gamma, color space and/or color temperature settings may require adjustment. Review all settings, and refer to *3.6, Adjusting the Image and 3.7, Adjusting System Parameters and Advanced Controls.*

Symptom ⏩ The display is not rectangular…
CAUSE / REMEDY:

1. Check leveling of the projector. If necessary, try relocating the projector or screen so that the lens surface and screen are approximately parallel
2. Is the vertical offset set correctly? Adjust as necessary using the vertical offset knob on the front of the projector.
3. The "Vertical Stretch" option may need adjustment. Also check pixel tracking.

Symptom ⏩ The display is "noisy"…
CAUSE / REMEDY:

1. Display adjustment may be required. Adjust pixel tracking, phase and filter.
2. The video input may not be terminated. Make sure the video input is terminated (75 Ω). If it is the last connection in a loop-through chain, the video input should be terminated at the *last* projector only.
3. The signal cables carrying the input signal may be of poor quality. Use only good quality signal cables.
4. The distance between the input source device and the projector may be too great. If the distance between the input source device and the projector is greater than 25 feet, signal amplification/conditioning may be required.
5. The input signal may be of poor quality.
6. If the source is a VCR or off-air broadcast, detail may be set too high. Keep near 4 for most sources.

Specifications

5.1 Specifications

NOTE: Due to continuing research, specifications are subject to change without notice.

Display ⏩

Resolution

Pixel format (H x V) on 3 DMD panels	1280 x 1024
Maximum digitizing sample rate	160 Mega samples per second
Video luminance bandwidth	5.5 MHz

Brightness

3000 ANSI lumens, typical

Contrast Ratio

Greater than 250:1 ANSI
Greater than 400:1 full on/full off

Colors and Gray Scale

Displayable colors	16.8 million
Gray scale resolution	13 bits

Color Temperature

Default	6500K
Range of Adjustment	3200K to 9300K

Lenses ⏩

Lens Type / Throw Ratio	Diagonal Screen Size (ft.)	Max. % of image Offset from Lens Center		
0.8:1	5-25	↑ 105%	↓ 100%	↔ 77%
1.2:1	5-30	↑ 126%	↓ 133%	↔ 85%
1.5-2.2:1 zoom	5-40	↑ 129%	↓ 117%	↔ 77%
2.2-4:1 zoom	5-40	↑ 129%	↓ 117%	↔ 77%
4-7:1 zoom	8-40	↑ 137%	↓ 126%	↔ 77%

NOTES: 1) The VistaGRAPHX lens (see above) requires a threaded adapter/flange for installation in this projector.
2) Maximum offset percentages are reduced when simultaneously offsetting horizontally and vertically.

Inputs ⏩

Number of inputs	1 RGB/Component

SPECIFICATIONS

Analog RGB and YPbPr (INTERLACED OR PROGRESSIVE SCAN FORMAT)

Horizontal frequency range	15 - 120 kHz *
Vertical frequency range **	24 -120 Hz
Pixel clock rate	10 - 160 MHz
Signal format	Analog RGB or YPbPr
Input levels	
R,B,G,Y - with sync	1.0Vp-p ±2 dB
R,G,B - without sync	0.7Vp-p ±2 dB
Pb,Pr	0.7Vp-p ±2 dB
DC offset	± 5V
Nominal impedance	75 ohms
Maximum return loss (VSWR)	1.2:1 dB @ 200 MHz

* Display quality may be limited by pixel sampling rate when at the higher end of the frequency range.

** Maximum vertical output rate = 72 Hz. H and V frequencies of the input source and of the DMDs may not be the same.

Analog Video (optional)

Signal formats	Composite, S-Video (Y/C)
Video standards	NTSC, NTSC 4.43, PAL, PAL-M, PAL-N, PAL-60 & SECAM
Input level, Composite	1.0 Vp-p ± 3db (including sync tip)
Input level, S-Video, Luma (Y)	1.0 Vp-p ± 3db (including sync tip)
Input level, S-Video, Chroma (C)	630 mVp-p nominal (burst)
DC offset	± 5V
Nominal impedance	75 ohms
Maximum return loss (VSWR)	1.2:1 dB @ 6 mHz

Sync (INTERLACED OR PROGRESSIVE SCAN FORMAT)

Input levels	0.5Vp-p - 5.0Vp-p
Impedance (for composite or separate H & V)	75 ohms
Sync type	· Separate H and V · Bi-level or tri-level sync-on-green · Bi-level or tri-level composite
Polarity	Positive or negative
Duty cycles	0.10% - 20% vertical3% - 20% horizontal
Maximum return loss (VSWR)	1.2:1 dB @ 200 MHz

Audio

Number & type of inputs	4 pairs of phono plug
Nominal input and output level	1.0 Vp-p
DC offset	± 2V
Impedance	30k ohms ± 10k ohm
Volume control range	-60 dB to +20 dB
Bandwidth (± 3 dB)	30 Hz to 20 kHz

RS-232 Serial Input

Number of connectors	3 (1 network in, 1 network out, 1 for switcher control)
Connector type	9 pin D

RS-422 Serial Input

Number of connectors	2
Connector type	6-pin XLR

SPECIFICATIONS

Wired Control Input	
Optional wired keypad	3-pin XLR connector
Input level	High 2.0V min., Low 0.7V max.
Power Requirements ⏩	
Voltage range (auto switching)	100 to 240 VAC continuous
Line frequency	50 - 60 Hz nominal
Max. inrush current	60 amps
Max. current rating	11.5 amps @ 100V 5.5 amps @ 220V
Max. power consumption	1200 watts
Line cord rating	High current, 13 amp
Lamp ⏩	
Type	700 watt Xenon short arc, open
Adjustment range	450-700 watts
Operating angle	any vertical angle, ±15° horizontal
Warm up period to full brightness	5 minutes
Rated life	1000 hours to half intensity
IR Control ⏩	
Typical range	100', line-of-sight
IR carrier frequency (subcarrier modulated)	336 kHz
Battery type (4 required)	AA 1.5 V (Alkaline cells)
Battery life	1 yr. Shelf, 1 mo. continuous use
Size & Weight ⏩	
Size (W x L x H of product only, no lens)	20.75" x 30.813" x 13.125”
Weight of product, no lens	156 lb.
Shipping weight	NA

EMI ⏩

47CFR 2&15 (FCC) Class B - U.S. - Conducted and Radiated Emissions Standards

SPECIFICATIONS

ESD Susceptibility: EN61000-4-2 Level 4
Radiated Susceptibility: EN61000-4-3 Level 3
EFT/Burst: EN6100-4-4 Level 4
Input transcient protection: EN61000-4-5 Level 3

Operating Environment ⏩

Temperature	0°C to 35°C (32°F to 95°F)
Humidity (non-condensing)	20% to 80%
Altitude	0 - 3000 meters

Standard Components ⏩

IR (infrared) Remote Keypad - includes batteries
High current 13 amp rated line cord
User's Manual
Warranty Registration Card
9/64" hex socket ball driver

VHD Ultra Controller Manual

The software installed in the **VHD Ultra Controller** is protected by copyright laws and International copyright treaties, as well as other intellectual property laws and treaties.

IMPORTANT - READ CAREFULLY: This Runco License Agreement is a legal agreement between you (either an individual or a single entity) and Runco International for the Runco software product installed within the **VHD Ultra Controller**. By using the **VHD Ultra Controller**, you agree to be bound by the terms of this License Agreement. If you do not agree to the terms of this License Agreement, do not use the
VHD Ultra Controller; you may, however, return it to your place of purchase.

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Warnings and Safety Precautions

CAUTION:
To turn off main power, be sure to remove the plug from power outlet. The power outlet socket should be installed as near to the equipment as possible, and should be easily accessible.

REMARQUE:
Pour mettre l'appareil hors circut, s'assurer de retirer la fiche de la prise d'alimentation. La prise d'alimentation doit être installé aussi proche que possible de l'appareil et doit être facile d' accès.

⚠ WARNING

TO PREVENT FIRE OR SHOCK HAZARDS, DO NOT EXPOSE THIS UNIT TO RAIN OR MOISTURE. ALSO DO NOT USE THIS UNIT'S POLARIZED PLUG WITH AN EXTENSION CORD RECEPTACLE OR OTHER OUTLETS, UNLESS THE PRONGS CAN BE FULLY INSERTED. REFRAIN FROM OPENING THE CABINET AS THERE ARE HIGH-VOLTAGE COMPONENTS INSIDE. REFER SERVICING TO QUALIFIED SERVICE PERSONNEL.

⚠ AVERTISSEMENT

POUR EVITER UN FEU OU UN RISQUE D'ELECTROCUTION NE PAS EXPOSER CET ENSEMBLE A LA PLUIE OU A L'HUMIDITE; DE MEME, NE PAS BRANCHER LA PRISE POLAIRE AVEC UNE RALLONGE A MOINS QUE LES DENTS DE LA PREMIERE NE S'Y INSERENT PLEINEMENT.

EVITER D'OUVRIR LE COFFRET CAR IL Y A, A L'INTERIEUR, DES COMPOSANTS SOUMIS A UNE HAUTE-TENSION; POUR LES REPARATIONS, S'ADRESSER A UN PERSONNEL QUALIFIE.

WARNING:

This equipment has been tested and found to comply with the limits for a Class B digital device, pursuant to Part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference when the equipment is operated in a commercial environment. This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the installation manual, may cause
harmful interference to radio communications. Operation of this equipment in a residential area is likely to cause harmful interference, in which case, the user will be required to correct the interference at his own expense.

DOC compliance Notice
This Class B digital apparatus meets all requirements of the Canadian Interference-Causing Equipment Regulations.

DOC avis de conformation
Cet appareil numérique de la classe B respecte toutes les exigences du Réglement sur le Matériel D'interférence du Canada.

Safety Tips

Please read and follow the safety precautions listed below to ensure the equipment is free from damage, and to ensure that no injury will occur as a result of improper use.

- Do not insert any object, especially metal or liquids, into the **VHD Ultra Controller.**
- Do not place any objects containing water or any other liquid on top of the **VHD Ultra Controller.**
- Do not place the unit in direct sunlight, near heaters or in extremely dusty or humid locations
- Do not install this unit outdoors or otherwise exposed to the elements
- Do not place heavy objects on top of the unit
- If the power cord is damaged or frayed in any way, electrical shock and/or fire may result. Please do not place objects on the power cord, and keep the cord away from heat-emitting devices. Should the power cord become damaged in any way, please contact your Runco dealer for a replacement cord.
- Do not remove the cover of the unit for any reason. If any problems arise with the unit, please contact a Runco dealer or Runco International for service. Removing the cover will void the warranty.

INTRODUCTION

General Description

Congratulations on your purchase of the **VHD Ultra Controller** video processor with Vivix™ technology! This processor is designed to maximize the image quality of your fixed-pixel display or rear-screen television while adding an extra level of flexibility to your system. The **VHD Ultra Controller's** Vivix™ processing techniques enable this processor to be used most efficiently with fixed-pixel displays, and will provide the most stunning image that your display can possibly deliver.

Vivix™ is a proprietary technique developed by Runco engineers to match the output resolution of the processor precisely to the display it will be used with. This precision processing technique resolves all the problems that conventional video processors have with fixed-pixel displays, which include pixel-tracking artifacts (jagged lines, moiré, jerky motion, etc.), too much overscan (significant loss of image) and even improper and disproportionate aspect ratios. The results of Vivix™ technology is an image that nearly rivals that of a CRT, while providing three geometrically-correct aspect ratios on a 16:9 or a 4:3 screen.

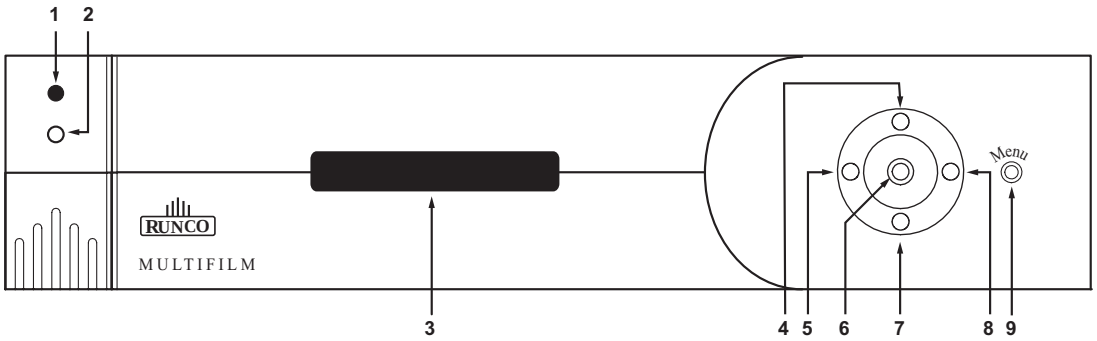
Features and Benefits

The **VHD Ultra Controller** have many great features and benefits that make it a flexible, high-quality processor. Its many benefits include:

- Vivix™ Technology, which maximizes image quality and flexibility of fixed-pixel displays.
- An adaptive 2-dimensional comb filter that greatly reduces artifacts when using a composite video signal as an input.
- A Luma edge enhancement circuit makes the edges of objects appear sharper without the ringing and noise increase associated with traditional sharpness circuits
- A Chroma edge enhancement circuit is included to compensate for lower chroma resolution found in composite and S-video.
- Inverse Telecine (3:2 pulldown) detection and processing allows the scaler to almost completely eliminate interlace artifacts associated with other scalers
- The controller can correctly scale anamorphic, letterbox and 4:3 formats to fit on a wide aspect-ratio screen, and scale anamorphic formats on a 4:3 screen
- A pass-through connector is supplied for routing HDTV or computer graphics directly to the display.
- An RS-232 input is provided for easy integration into the automated home theater environment
- A TBC (Time Base Corrector) circuit is provided for unstable sources such as VCR's.
- 12V outputs are provided for drop screens and screen masking.
- A simple 7-button remote controls all aspects of operation. One button source selection and aspect ratio control is also provided via the remote control.

FRONT AND REAR PANEL DESCRIPTIONS

Front Panel



1. IR RECEIVER
Receives the IR commands from the remote control.

2. POWER BUTTON
Toggles the power on and off. For a discreet on or off command, you can use the direct access buttons on the remote control. **NOTE:** When the main AC power switch is first turned ON, the processor will go through an initiation cycle for approximately 15 seconds. The processor cannot be turned on or operated until the initialization is complete

3. LED DISPLAY
Indicates the model number, current source, resolution and aspect ratio.

4. UP BUTTON
When no menus are present on-screen, the UP button will toggle you through aspect ratios in the following order:
Letterbox → Standard (4:3) → Anamorphic
When the menu is on-screen, the UP button will move the cursor up within the menu.
When an adjustment item has been selected (i.e. brightness), the UP button will increase the value of that function.

5. LEFT BUTTON
When no menu is present on-screen, the LEFT button will toggle you through the four different sources, in the order of:
Pass-through → Component → S-Video → Composite

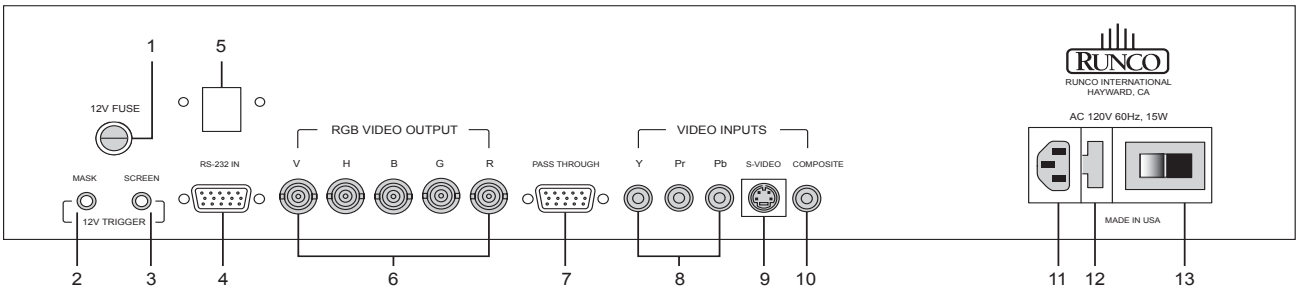
6. ENTER BUTTON
When an item is highlighted on the On-Screen Display, the ENTER button will select the item.

7. DOWN BUTTON
When no menu is present on-screen, this button will toggle you through the different aspect ratios.
When the menu is on-screen, the down button will move the cursor down within a menu. When an adjustment function has been selected (i.e. brightness), the DOWN button will decrease the value of that function.

8. RIGHT BUTTON
When no menus are present on-screen, the RIGHT button will toggle you through the four different sources, in the order of:
Composite → S-Video → Component → Pass-through

9. MENU BUTTON
Pressing the MENU button will bring up the main menu. If no action is taken within approximately 10 seconds, the menu will time-out (disappear). Also, if you are in an adjustment mode or function, pressing MENU will bring the menu back one level.

Rear Panel



1. **12v Fuse**
   This fuse protects the 12v outputs from the MASK and SCREEN jacks.
   (Screen Fuse: 5mm x 25mm, AGC, 0.5A 250V Fast Acting, 250V, Fast Blow)

2. **Mask**
   This is a 12V output that is used to trigger masking on screens that have that capability.
   (For use on motorized screens only).

3. **Screen**
   This is a 12V output that is used to trigger the screen to drop.
   (For use on motorized screens only).

4. **RS-232 In**
   This is for systems using serial (RS-232) to control the **VHD Ultra Controller**.

5. **Reserved for future use.**

6. **RGB OUTPUT**
   This is the main output of the **VHD Ultra Controller**. The RGB Signal goes directly to the VX-5c Projector. If component is used through the pass-through, then only the R (Pr), G(Y) and B(Pb) jacks will be active. Individually, the jacks are: V=vertical sync, H=horizontal sync, B=Blue, G=Green, R=Red.

7. **Pass-through**
   Anything input to this port will by-pass the processing of the **VHD Ultra Controller** and be sent straight to the VX-5c Projector. This is useful for computer graphics and HDTV signals which do not require processing.

8. **Component Input**
   This is the input for component video from sources such as DVD players.
   Note: The component output from a DTV decoder or a progressive-scan DVD cannot be used with this port; it must be input to the Pass-through port.

9. **S-Video Input**
   This is the input for S-video from sources such as Satellite receivers, S-VHS VCR's and DVD players.

10. Composite Video Input

This is the input for Composite video from sources such as Laser disc players, VCRs and other miscellaneous video sources.

11. Power Input

Plug in main power here.

12. 115 VAC Fuse

This is the main AC input fuse.(Main Fuse: 5mm x 20 mm, 500mA, 250v, Slow Blow)

13. Main Power Switch

Disconnects or applies main power to the processor.

REMOTE CONTROL DESCRIPTION

A. IR OUTPUT INDICATOR
Illuminates when a button is pressed, indicating that an IR signal is being transmitted.

B. POWER BUTTON
Toggles the power on and off. For a discreet on or off command, you can use the direct access buttons (see 'J'). **Note:** When the main AC power switch is first turned ON, the processor will go through an initiation cycle for approximately 15 seconds. The processor cannot be turned on or operated until the initialization is complete.

C. UP BUTTON
When no menus are present on-screen, the UP button will toggle you through aspect ratios in the following order:
Letterbox → Standard (4:3) → Anamorphic
When the menu is on-screen, the UP button will move the cursor up within the menu. When an adjustment item has been selected (i.e. brightness), the UP button will increase the value of that function.

D. LEFT BUTTON
When no menus are present on-screen, the LEFT button will toggle you through the four different sources in the following order:
Pass-through → Component → S-Video → Composite

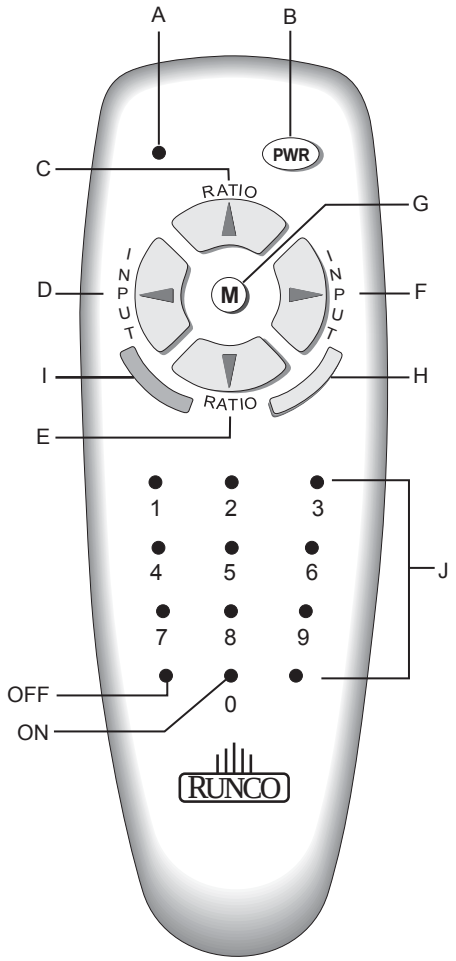
E. DOWN BUTTON
When no menus are present on-screen, the DOWN button will toggle you through aspect ratios in the following order:
Anamorphic → Standard (4:3) → Letterbox
When the menu is on-screen, the DOWN button will move the cursor down within the menu. When an adjustment item has been selected (i.e. brightness), the DOWN button will decrease the value of that function.

F. RIGHT BUTTON
When no menus are present on-screen, the RIGHT button will toggle you through the four different sources in the following order:
Composite → S-Video → Component → Pass-through

G. MENU BUTTON
Pressing the MENU button will bring up the main menu. If no action is taken within approximately 10 seconds, the menu will time-out (disappear). Also, if you are in an adjustment mode or function, pressing MENU will bring the menu back one level.

H. ENTER BUTTON
When an item is highlighted on a menu, pressing ENTER will select that item.

I. PROGRAM BUTTON
If the remote control loses its 'memory' as a result of weak or dead batteries, it must be re-programmed for the **VHD Ultra Controller's** code set. To reprogram the remote, press the PROGRAM button followed by 0,1,3. **Note:** Pressing Enter after typing in the code is not necessary.

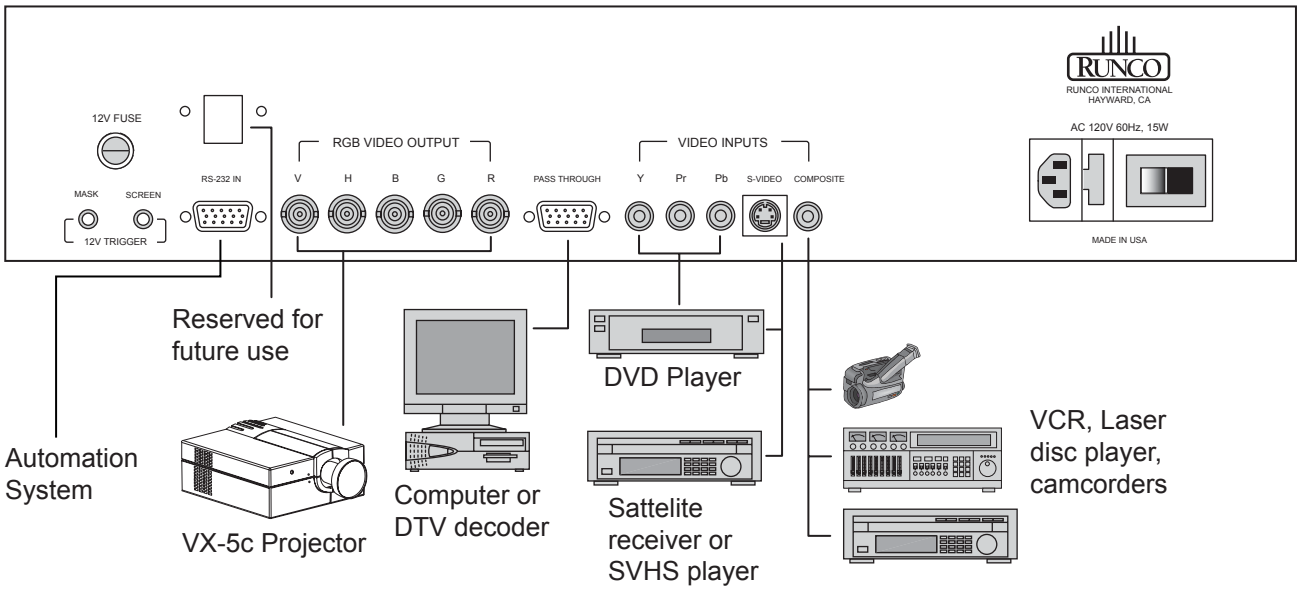


J. DIRECT ACCESS BUTTONS
These buttons will allow you to directly access an aspect ratio, source, or turn the unit on or off without having to go through any menus. These buttons are:

1: Selects COMPOSITE video
2: Selects S-video
3: Selects COMPONENT video
4: Not used
5: Selects PASS-THROUGH
6: Enables or Disables the Installation Menu (see page 6-13)
7: Selects the ANAMORPHIC aspect ratio
8: Selects the STANDARD (4:3) aspect ratio
9: Selects the LETTERBOX aspect ratio
0: Turns the processor ON.
OFF: Also known as the button left of '0', this turns the processor OFF.

QUICK SET-UP GUIDE

Connection Examples



While there are many different ways to connect your source equipment to your **VHD Ultra Controller**, the examples shown above are the most common.

• COMPOSITE VIDEO INPUT:
Composite video is the most common type of signal used, but is also the lowest in picture quality. Many sources have outputs that are limited to composite video, such as some VCR's and camcorders; others such as Laser Disc players actually produce slightly better results when using composite video.

• S-VIDEO INPUT
S-video is the second-best type of signal that can be used, but is MUCH better than composite video. Using such sources as Satellite receivers, high-quality VCRs and DVD players (with no component output) will produce a MUCH cleaner and sharper signal.

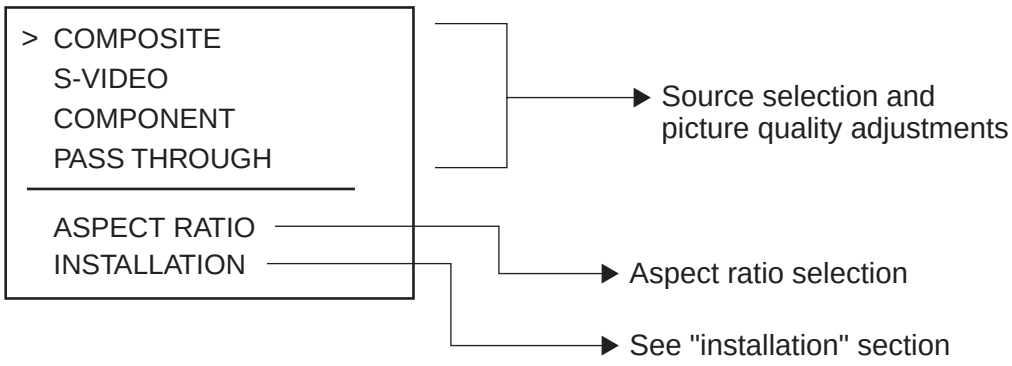
• COMPONENT INPUT
Component video is the best type of signal that can be used. The most common sources that use component outputs are DVD players, and it is highly recommended that component be used when possible. Component video goes one step beyond S-video in picture quality; chroma (color) information is more resolved and the overall picture appears more well-defined.

• PASS-THROUGH
This input is used to 'pass-through' any high-definition or computer signals that do not require processing. The signal by-passes the **VHD Ultra Controller's** processing and is sent directly to the display. The pass-through may be used for COMPONENT outputs from a DTV decoder, a progressive-scan DVD player or RGB outputs from a computer or other high-resolution sources.

MENU DESCRIPTION AND NAVIGATION

Main Menu

MAIN MENU



When the MENU button is pressed on either the remote control or the front panel, the main menu will appear on-screen. An example of the main menu is shown above.

The active source is indicated by an arrow to the left of the source; note that in the example above, Composite is the current source.

To select a source via the main menu, press either the up or down buttons on the remote or front panel and highlight the desired source, and press ENTER. Otherwise, you may select a source by pressing either the left or right arrow buttons (on the remote or front panel) when no menus are on-screen, or by pressing one of the direct access buttons on the remote control (recommended; see page 6-8).

If pass-through is selected, note that no on-screen menus will be displayed since the signal is simply being 'looped' directly to the output. When pass-through is the selected source, pressing MENU will automatically select the last selected input before Pass-through was selected. If you wish to choose another source, Runco recommends using the direct access buttons to select the desired source as opposed to pressing MENU.

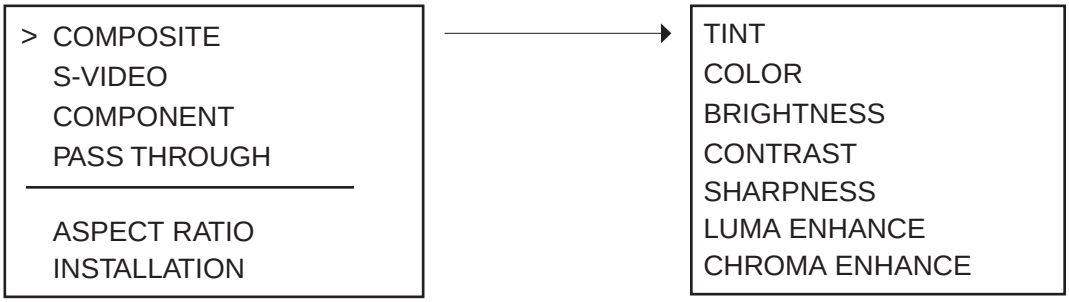
Aspect Ratio provides selection of one of three aspect ratios: Anamorphic, Letterbox or standard 4:3. To select an aspect ratio via the main menu, press either the up and down buttons on the remote or front panel, highlight ASPECT RATIO and press ENTER. The aspect ratio menu will then appear with the three choices; highlight the desired aspect ratio with the up or down buttons and press ENTER. Otherwise, you may select an aspect ratio by pressing either the up or down arrow buttons (on the remote or front panel) when no menus are on-screen, or by pressing one of the direct access buttons on the remote control (recommended; see page 6-8).

Installation is where the image shift and blanking controls are located. A full description of this menu is on page 6-13.

NOTE: If INSTALLATION does not appear on the main menu, see page 6-13 for an explanation on how to access the Installation menu.

Picture Quality Adjustments

MAIN MENU



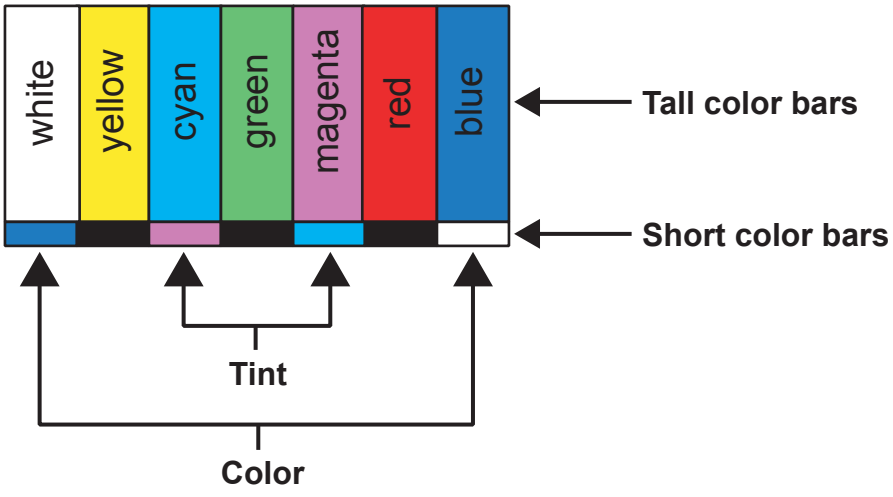
Picture quality adjustments (also known as "Front Panel Controls") are the controls that change different parameters of the image such as the amount of color, black level, etc. While these adjustments can be set to suit the needs of the user, there is a way to set these properly. This section will describe what each function does and how to adjust them properly.

To access the picture quality adjustments, press MENU, highlight the active source (indicated by the arrow) and press ENTER. The picture quality sub-menu will then appear (see above).

To make an adjustment to a particular function, highlight the function with the up or down arrow buttons and press ENTER. Once the function is on-screen (i.e. brightness), pressing the UP arrow button on the remote or front panel will increase the value of that function; pressing the DOWN arrow on the remote or front panel will decrease the value of that function.

While each of the picture quality adjustments can be set to suit the needs of the user, there is a 'proper' way to set the adjustments. For setting TINT and COLOR, please refer to the color bar test pattern below.

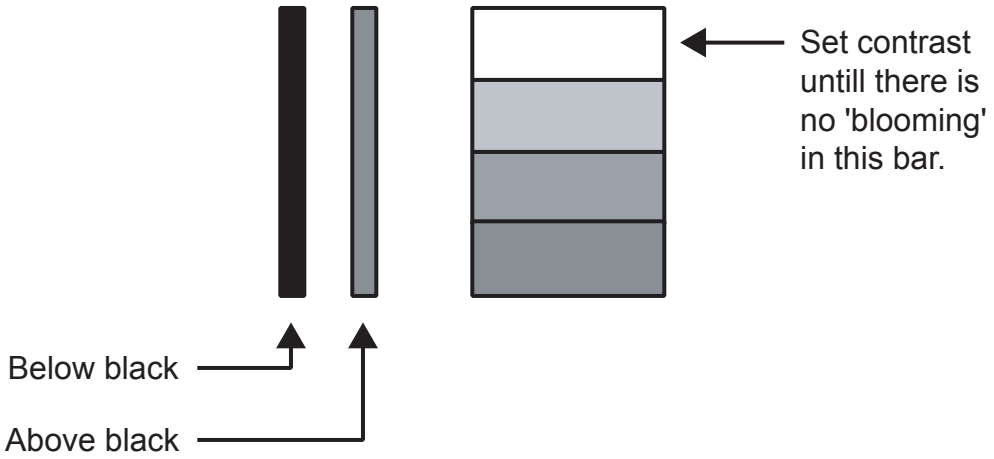
NOTE: Runco recommends that a BLUE FILTER be used so only the blue color bars can be seen. Blue filters are provided with the Video Essentials or AVIA test DVDs, or can be purchased from the Imaging Science Foundation (www.imagingscience.com).



TINT (also known as 'hue') is essentially the ratio of red to green in the color portion of the image. If TINT is decreased, the image will appear redder, and increasing it will cause the image to appear greener. To set TINT properly, look at the color bar pattern through a blue filter (or mute the red and green outputs). Adjust TINT until the middle two tall color bars match the middle short color bars (see color bar drawing).

COLOR (also known as 'saturation') increases or decreases the amount of color in the image. To set COLOR properly, look at the color bar pattern through a blue filter (or mute the red and green outputs). Adjust COLOR until the outer two tall color bars match the outer short color bars (see color bar drawing).

For setting ***CONTRAST*** and ***BRIGHTNESS***, please refer to the PLUGE pattern below:
CONTRAST adjusts the white level of the image. To adjust this properly for CRT projectors, adjust



CONTRAST until there is no blooming (or distortion) in the brightest bar in the PLUGE pattern (see above). For Fixed-pixel displays, adjust contrast until there is a distinct definition between the two brightest bars.
NOTE: For best results, Runco recommends that CONTRAST be set to '0' or very close to it.

BRIGHTNESS adjusts the black level of the image. To adjust this properly, adjust BRIGHTNESS until the 'below black' bar JUST disappears, but the 'above black' bar is still barely visible.
NOTE: Some DVD players cannot pass the 'blacker than black' bar (they won't pass PLUGE), and that bar will never be visible. In a case like this, adjust the 'above black' bar until it is slightly brighter than the background that surrounds it.

SHARPNESS adjusts the amount of high-frequency detail in the image. This can be adjusted to the preference of the user. Keep in mind that when SHARPNESS is decreased, fine details in the image will become 'soft'; when it is increased, fine details will become sharper but will also make the picture appear 'noisy' if adjusted too high.

LUMA ENHANCE acts as an edge enhancement, especially around black to white transitions in the image. Essentially, this has the same characteristics as sharpness but affects the edges of objects far more that the rest of the image.

FREQUENCIES HIGH/LOW affect the overall range of the LUMA ENHANCE feature. For example, if using a lower-quality video source such as a VCR, the FREQUENCIES should be set to LOW. For a good quality source such as a DVD player, set FREQUENCIES to HIGH. To set FREQUENCIES, press ENTER while LUMA ENHANCE is on-screen.

CHROMA ENHANCE acts as an edge enhancement, especially around color transitions in the image. Essentially, this has the same characteristics as sharpness but affects the edges of objects far more that the rest of the image.

FREQUENCIES HIGH/LOW affect the overall range of the CHROMA ENHANCE feature. For example, if using a lower-quality video source such as a VCR, the FREQUENCIES should be set to LOW. For a good quality source such as a DVD player, set FREQUENCIES to HIGH. To set FREQUENCIES, press ENTER while CHROMA ENHANCE is on-screen.

Installation Menu

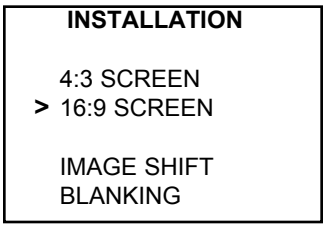
The Installation menu is where you can adjust the type of screen (4:3 or 16:9), shift the image or set blanking.

When the **VHD Ultra Controller** is turned on for the first time, the INSTALLATION item will not appear in the main menu. To enable the INSTALLATION menu, there are two options:

· With the processor *ON* and no menus on-screen, simultaneously press the *ENTER*, *UP* and *LEFT* buttons (you don't need to hold them down). Release the three buttons and press MENU, ensure INSTALLATION is now on the bottom of the main menu.

· With the remote control, press button 6 (with no menus on-screen).
After pressing '6', press *MENU* and ensure INSTALLATION is now on the bottom of the main menu.

After INSTALLATION has been accessed, press *MENU*, highlight INSTALLATION and press *ENTER*. This will bring up the INSTALLATION MENU, shown below:



Screen Type

When you are installing the system for the first time, the first order of business is to define what type of screen will be used with this system. If a 1.78:1 (16:9) or 1.85:1 screen is used, highlight 16:9 SCREEN and press ENTER. If a standard 4:3 screen is installed, highlight 4:3 SCREEN and press enter.

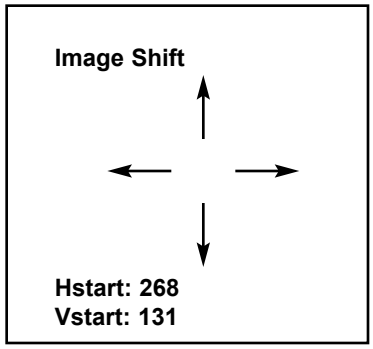
The purpose of defining the screen type is to tell the processor how to create aspect ratios (see page 6-16 for a definition of aspect ratios). For example, on a 16:9 screen, the letterbox and anamorphic aspect ratios will use the entire 16:9 screen, and the 4:3 aspect ratio will be displayed in the center of the 16:9 screen (you'd have 'black bars' on the left and right sides of the image).

On the other hand, on a 4:3 screen, the 4:3 aspect ratio would fill the screen, but the letterbox and anamorphic aspect ratios would be displayed in the center of the screen vertically (there would be 'black bars' on the top on bottom of the image).

Image Shift

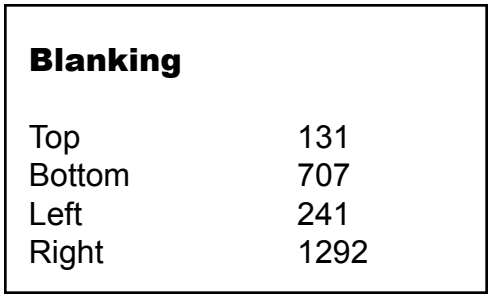
IMAGE SHIFT moves the entire image up, down, left or right. If the image is slightly off-center on-screen after installation, using IMAGE SHIFT can center the image on your screen or display.

While using IMAGE SHIFT will not cause any problems with your display, it is possible to use too much image shift, which could cause the image to shake or disappear. Therefore, Runco recommends that image shift be done with the display device itself whenever possible.



Blanking

The **BLANKING** function allows you to 'cut off' part of the image to fit the screen properly, or to eliminate anomalies on the extreme outsides (usually the top) of the image. This can be done to the top, bottom, left or right sides individually.



To adjust **BLANKING**, highlight the desired area you wish to blank (top, bottom, left or right), and use the left and right arrows to make the adjustment.

Most CRT projectors themselves have blanking controls, and it is recommended that you use the controls on the projector as opposed to the processor, if possible. In the event that your display device does not have blanking controls, however, use the blanking controls provided in the processor.

System Reset

In the event that your **VHD Ultra Controller** appears to have a software problem, or adjustments have been made so far out of range that the image is no longer on-screen or discernable, you can reset the processor back to factory values. This sets ALL settings back to factory values, so any adjustments made previously will be lost.

To reset your VHD Ultra Controller, follow this procedure:

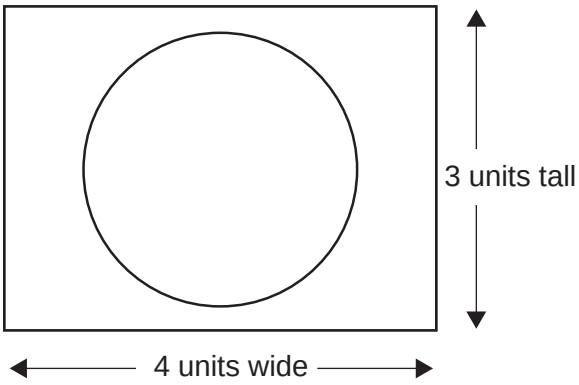
- Turn off the MAIN POWER switch on the back of the processor
- Hold down the DOWN ARROW button, and turn the MAIN POWER SWITCH back on. Continue holding the down arrow button until the LED on the front panel blinks, then release the down arrow button.

Once this is done, your processor has been completely reset to factory values.
After resetting the unit, Composite video will be the active source.

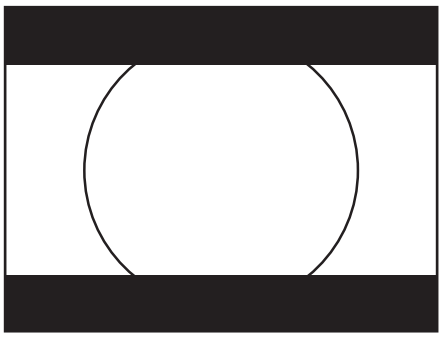
SYSTEM RESET is not on any of the menus; it must be performed using the instructions above.

ASPECT RATIOS

An ‘aspect ratio’ is simply the ratio of the width vs. the height of the screen. For example, the current aspect ratio standard is 4:3 (or 1.33:1), where the image is 4 units wide and 3 units tall.

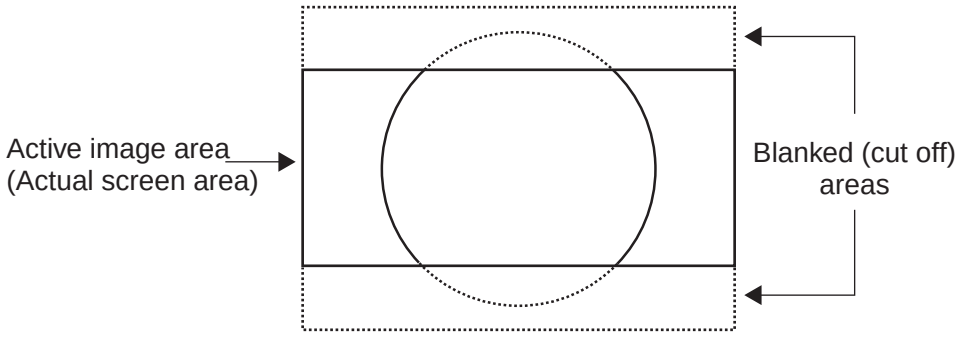


All of our ‘regular’ televisions are this aspect ratio. You have probably noticed that occasionally you’ll watch a movie that does not fill the screen vertically. This is because the movie was filmed in WIDESCREEN (letterbox), and the result is ‘black bars’ above and below the image:



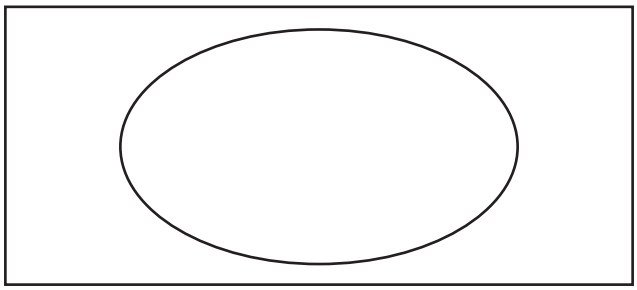
Obviously, watching a movie like this does not lend itself to a truly cinematic experience!
This is why Runco invented the first-ever multiple aspect-ratio projection system back in 1991, so true movie-lovers can watch actual widescreen (letterbox) movies on a WIDESCREEN!

A WIDESCREEN can be a number of aspect ratios; many movies are either 1.85:1 or 2.35:1, and HDTV is always 1.78:1 (16:9). The way we create a widescreen (or LETTERBOX) aspect ratio is to take a full 4:3 image, then ‘blank’ (or cut off) the top and bottom so the displayed image is in a widescreen format. For movies recorded in ‘letterbox’, there would be no information above and below the screen anyways, so we’re not losing any of the picture. However, if you were to watch standard television broadcast this way, you would lose some information (see next drawing).



As you can see, our screen in this example is a 1.85:1 ratio. The dashed lines show the area that we 'blanked'. If you recall, watching a letterbox movie on a 4:3 screen gave us black bars; therefore with letterbox movies, we're not losing any information!

The 'other' type of widescreen is called 'ANAMORPHIC'. The image is still a widescreen format, but instead of 'blanking' the top and bottom, we simply reduce the overall height of the image:

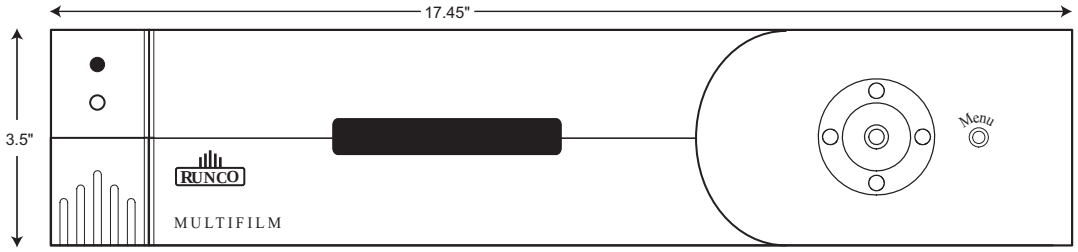


As a result, all objects will be 'short and fat' (like the circle above), right? Well, not if you're using software that is anamorphic. Most (but not all) DVD movies have an anamorphic option.

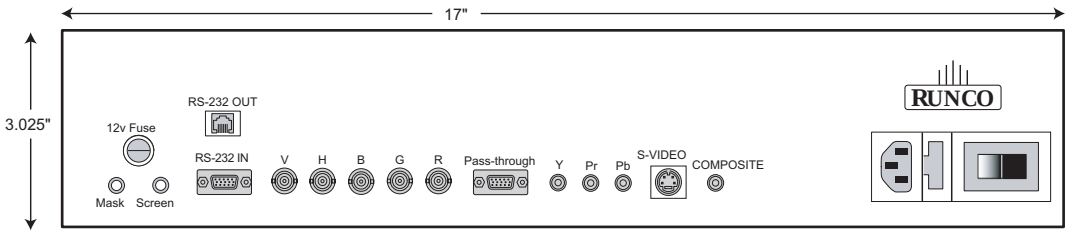
Anamorphic material will always produce a better image when using a high quality scaler such as the **VHD Ultra Controller.** The reason is that you will actually get more lines of resolution (and ultimately more detail) when using anamorphic titles. Basically, a TV image is made of 480 lines. When using LETTERBOX (the drawing at the top of the page), we're 'throwing away' information by blanking the top and bottom. The end result is that there will only be around 360 lines of information on the screen and 480 with anamorphic.

DIMENSIONS

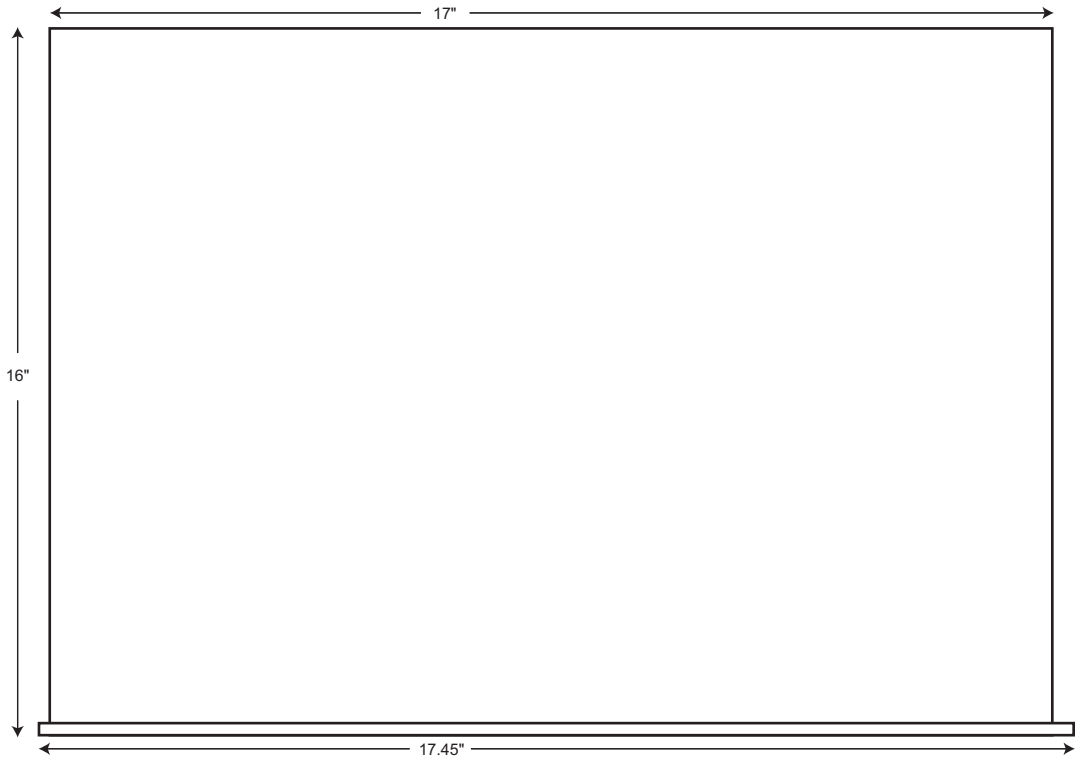
Front Panel



Rear Panel



Top



Side

RS-232 COMMUNICATIONS

General Information

Baud rate: 9600 (fixed)
Bits: 8
No Parity

All protocol in ASCII format

RS-232 input connector pin numbers: **TxD= Pin# 2**
RxD= Pin# 3
GnD= Pin# 5

Command format (single command): command value (i.e. brightness 30).

NOTE: A space (not an underscore) must be used between the command and its value.
All Commands must be followed by a carriage return.

Command string format: command,command value, command etc.
(i.e. COMPOSITE,BRIGHTNESS 30,ANAMORPHIC)

NOTE: In between commands, a comma or space can be used; a space must be used in between a command and its value. **All commands must be followed by a carriage return.**

Other notes:

- **All Commands must be followed by a carriage return.**
- For command strings, a maximum of 255 characters can be used in a single string.
- If it is necessary to input multiple commands, they should all be together in a single string. Inputting commands one at a time requires an arbitrary delay between commands while the commands are being executed. Therefore, programming requires delays and is more difficult.
- For values not automatically stored (see next paragraph), the command "!STORE" must be sent in order for the **VHD Ultra Controller** to keep the settings. Otherwise, the values will be considered temporary and will revert to their stored settings upon source change or power-up.
- The "Value stored" column refers to a command that is either automatically stored or if it must be manually stored with the "!STORE" command.
- PARAMETER min/max refers to a function's minimum and maximum value range. Inputting values above or below their range may cause unpredictable (but not fatal) results.
- After each command is entered, the Controller returns the “>” symbol as a prompt (ASCII code Ox). Use this symbol as an acknowledgement if your control system requires it.

RS-232 COMMANDS

COMMAND	PARAMETER (min/max)	Value stored?	DESCRIPTION
ON	NA	NA	Turns VHD Ultra Controller on
OFF	NA	NA	Turns VHD Ultra Controller off
DISPLAY	0/4	YES	Adjusts the brightness of the front panel display
COMPOSITE	NA	YES	Selects the Composite Video input
SVIDEO	NA	YES	Selects the S-Video Input
COMPONENT	NA	YES	Selects the Component Video input
PASSTHRU	NA	YES	Selects the Pass-through input
ANAMORPHIC	NA	YES	Selects the anamorphic aspect ratio
STANDARD	NA	YES	Selects the standard (4:3) aspect ratio
LETTERBOX	NA	YES	Selects the letterbox aspect ratio
TINT	-127/127	NO	Sets a value for tint
COLOR	-127/127	NO	Sets a value for color
AGCCOLOR	0/1	NO	0=Disable Color AGC 1=Enable Color AGC
BRIGHTNESS	-127/127	NO	Sets a value for brightness
CONTRAST	-127/127	NO	Sets a value for contrast
AGCCONTRAST	0/1	NO	0=Disable Contrast AGC 1=Enable Contrast AGC
SHARPNESS	0/255	NO	Sets a value for sharpness
CHROMAHIGH	0/127	NO	Sets a value for high-frequency chroma edge enhancement
CHROMALOW	0/127	NO	Sets a value for low-frequency chroma edge enhancement
LUMAHIGH	0/127	NO	Sets a value for high-frequency luminance edge enhancement
LUMALOW	0/127	NO	Sets a value for low-frequency luminance edge enhancement

COMMAND	PARAMETER (min/max)	Value stored?	DESCRIPTION
!STORE	NA	YES	Stores the current set of values (all values) into non-volatile memory
!RESTORE	NA	YES	Restores the stored values
!FACTORY	NA	YES	Restores all values to factory default levels
!STATUS	NA	NA	Asks the VHD Ultra Controller to provide the hardware informa tion, current values and system status to the automation system
!RESTART	NA	NO	Restarts the VHD Ultra Controller
!ECHO	NA	NO	Enables the VHD Ultra Controller to echo back commands and values to the automation system
!NOECHO	NA	NO	Disables the VHD Ultra Controller's character echoing
!INSTALLMODEOFF	NA	NA	Disables the Installation menu (removes it from the main menu)
!INSTALLMODEON	NA	NA	Enables the Installation menu (enables it on the main menu)

SPECIFICATIONS

Inputs:	(1) Composite, (1) S-video, (1) Component, (1) Pass-through
Input standards:	NTSC, PAL
Resolution:	1280 x 1024 (1280 x 720 on 16:9 screens)
Bandwidth:	Composite, S-Video and Component inputs: 5.5 MHz, Pass-through: 100 MHz
Power Requirements:	100-120 VAC, 50/60 Hz (200-240VAC, 50/60 Hz, export version)
Power Consumption:	15W
Control Options:	RS-232, IR, Front Panel
Operating Environment:	41°-95°F (5°-35° C), 0-90% humidity, Non-condensing
Dimensions:	Width: 17.45 in./443.23 mm Depth: 16 in./406.40 mm Height: 3.5 in./88.90 mm
Weight:	16 lbs./7.26 kg
Safety Regulations:	Complies with FCC Class 'B', CE, C-tick

Supplied Accessories

- Remote Control w/ 2 AAA Batteries
- Power Cord
- User's Manual

Glossary

This appendix defines the specific terms used in this manual as they apply to this projector. Also included are other general terms commonly used in the projection industry.

Active Line Time ⏩ The time, inside one horizontal scan line, during which video is generated.

Ambient Light Rejection ⏩ The ability of a screen to reflect ambient light in a direction away from the "line of best viewing". Curved screens usually have good ambient light rejection. Flat screens usually have less ambient light rejection.

Analog Video ⏩ The video output of most computers and video tape machines. Analog video can generate a large number of colors.

Aspect Ratio ⏩ The ratio of the width of an image to its height, such as the 4:3 aspect ratio common in video output.

Auto Source ⏩ The ability of the projector to automatically recognize and synchronize to the horizontal and vertical scan frequencies of an input signal for proper display.

Bandwidth ⏩ The frequency range of the projector's video amplifier.

Baud Rate ⏩ The speed at which serial communications travel from their origin. In this projector, the RS-232 or RS-422 default baud rate of 38400 can be changed to match a controlling device.

Blanking Time ⏩ The time inside one scan line during which video is not generated. The blanking time of the input signal must be equal to or greater than the retrace time of the projector.

Brightness ⏩ In projection, brightness usually describes the amount of light emitted from a surface such as a screen. It is measured in foot-lamberts or candelas per square meter.

Candela or Candle ⏩ Unit of measure for measuring intensity of light.

Channel ⏩ A collection of measurements stored by the projector for a given input source, including frequencies, pulse width, polarity, syncs, channel number and location, user-adjustable display settings, etc. Use channels to switch between a variety of setups quickly, automatically recalling previously defined display parameters.

Channel List ⏩ A list/menu of previously-defined channels available in projector memory.

Channel Number ⏩ A number that uniquely identifies a specific channel retained in projector memory. The projector can retain up to 99 channels.

GLOSSARY

Checkbox ⏩ A menu item that indicates whether an option is currently in effect (checked) or not (unchecked).

Color Shift ⏩ A change in the color of a white field across an image (white field uniformity).

Color Temperature ⏩ The coloration (reddish, white, bluish, greenish, etc.) of white in an image, measured using the Kelvin (degrees K) temperature scale. Higher temperatures appear bluer, while lower color temperatures appear redder.

Component Video ⏩ See YCbCr or YPbPr.

Composite Video ⏩ The output of video tape players and some computers, characterized by synchronization, luminance and color signals combined on one output cable.

Contrast (ratio) ⏩ The degree of difference between the lightest and darkest areas of the image.

Convergence ⏩ The alignment of the red, green, and blue elements of a projected image.

Curved Screen ⏩ A projection screen which is slightly concave for improved screen gain. Curved screens usually have screen gains which are greater than 1 but viewing angles much less than 180°. Curved screens are not recommended for use with this projector.

DDI ⏩ A Direct Digital Interface signal can be supplied to the projector via an optional digital input module installed in INPUT 2. For example, you can input an SMPTE-259M signal using a Serial Digital Input Module or input an SMPTE-272M signal from a HDTV Serial Input Module.

DMD™ ⏩ Digital Micromirror Devices™ used in this projector for processing red, green, and blue color data.

Decoder ⏩ Located at INPUT 3 and INPUT 4, this device converts NTSC 3.58, NTSC 4.4, PAL, PAL-N, PAL-M, or SECAM to RGB video.

Detail ⏩ The sharpness of a display from a video source.

Diffused Screen ⏩ A type of rear-projection screen which spreads the light striking it. Screen gain is less than 1 but audience viewing angles are increased.

Display Setting ⏩ An adjustment that affects the display of an image. Such display settings include contrast, brightness, tint, blanking, size, offsets, and others.

Flicker ⏩ A very rapid variation in image brightness caused by a frame rate that is too slow. (See Interlace.)

Frame Rate ⏩ The frequency at which complete images are generated. For non-interlaced signals, the frame rate is identical to the vertical frequency. For interlaced signals, the frame rate (also known as field rate) is one half of vertical frequency.

Foot-candle ⏩ The intensity of visible light per square foot.

Foot-lambert ⏩ The luminance (brightness) which results from one foot-candle of illumination falling on a perfectly diffuse surface.

Gain or Screen Gain ⏩ The ability of a screen to direct incident light to an audience. A flat matte white wall has a gain of approximately 1. Screens with gain less than 1 attenuate incident light; screens with gain more than 1 direct more incident light to the audience but have a narrow viewing angle. For example: An image reflecting off a

a 10 gain screen appears 10 times brighter than it would if reflected off a matte white wall. Curved screens usually have larger gain than flat screens.

Help Screen ⏩ A display of help information regarding the current task or presentation.

Horizontal Frequency ⏩ The frequency at which scan lines are generated, which varies amongst sources. Also called horizontal scan rate or line rate.

Horizontal Offset ⏩ The difference between the center of the projected image and the center of the projector lens. For this projector, this value is expressed as the maximum percentage of the image that can be projected to one side of the lens center without degrading the image quality. Horizontal offset ranges can be affected by the type of lens in use, and whether or not the image is offset vertically at the same time.

Hot Spot ⏩ A circular area of a screen where the image appears brighter than elsewhere on the screen. A hot spot appears along the line of sight and "moves" with the line of sight. High gain screens and rear screens designed for slide or movie projection usually have a hot spot.

Input ⏩ A physical connection route for a source signal, described by a 2-digit number representing 1) its switcher/projector location and 2) its slot in the switcher/projector.

Input Signal ⏩ Signal sent from a source device to the projector.

Interface ⏩ A device, such as the Serial Digital Input Module, that accepts an input signal for display by the projector.

Interlace ⏩ A method used by video tape players and some computers to double the vertical resolution without increasing the horizontal line rate. If the resulting frame/field rate is too low, the image may flicker depending on the image content.

Keypad ⏩ A small push-button device for controlling most projector settings and operation. For more information, refer to 3.3, Using the Keypad.

Keystone ⏩ A distortion of the image which occurs when the top and bottom borders of the image are unequal in length. Side borders both slant in or out, producing a keystone shaped image. It is caused when the screen and lens surface are not parallel.

Linearity ⏩ The reproduction of the horizontal and vertical size of characters and/or shapes over the entire screen.

Line of Best Viewing ⏩ When light from a projector is incident on a screen, the light reflects from the screen such that the angle of reflection equals the angle of incidence. The Line of Best Viewing is along the line of reflection.

Loop through ⏩ The method of feeding a series of high impedance inputs from a single video source with a coaxial transmission line in such a manner that the line is terminated with its characteristic impedance at the last input on the line.

Lumen ⏩ The unit of measure for the amount of visible light emitted by a light source.

Lux ⏩ The amount of visible light per square meter incident on a surface.
1 lux = 1 lumen/square meter = 0.093 foot-candles

GLOSSARY

Menu ⏩ A list of selectable options displayed on the screen.

NTSC Video ⏩ A video output format of some video tape and disk players. There are two types of NTSC (National Television Standards Committee) video: NTSC 3.58 and NTSC 4.43. NTSC 3.58 is used primarily in North America and Japan. NTSC 4.43 is less commonly used.

Optical Screen ⏩ A type of rear-projection screen which re-directs light through the screen to increase image brightness in front of the screen. Screen gain is usually greater than 1 but audience viewing angles are reduced.

PAL Video ⏩ PAL (Phase Alternating Line) video is a 50 Hz standard with 768 x 576 resolution. It is found on some video tape and disk players (used primarily in Europe, China and some South American and African countries).

Pincushion ⏩ A distortion of the image shape characterized by concave or convex borders.

Pixel (picture element) ⏩ The smallest discernible element of data from a computer-generated image.

Pixel Phase ⏩ The phase of the pixel sampling clock relative to incoming data.

Pixel Tracking ⏩ The frequency of the pixel sampling clock, indicated by the number of pixels per line.

Projector-to-Screen Distance ⏩
The distance between the projector's front feet centers and the screen. Also called "Throw Distance".

Protocol ⏩ The type of code format called "A" or "B" utilized by the remote keypad(s). The default protocol set at manufacture is Protocol "A". By using two different keypad protocols, adjacent projectors can be controlled independently with their remote IR keypads.

Pull-down List ⏩ A selectable menu item that unfolds into a list of options pertaining to it.

Rear Screen ⏩ A translucent panel for screen projection. Incident light travels through the incident surface of a rear screen and forms an image on the other surface.

Resizing ⏩ The ability to manipulate through software commands the physical size, placement and/or aspect ratio of an image.

Resolution (lens) ⏩ The maximum number of alternate white and black horizontal lines that can be distinguished on a screen when a photographic target is placed between the lens and a light source and illuminated by that source.

Resolution (projector) ⏩ The maximum number of pixels that the projector can display horizontally and vertically across an image, such as 1280 x 1024.

Retrace Time ⏩ (Horizontal) The minimum time required for a CRT projector to move the position of the scanning spot from the right edge to the left edge.

Rise Time ⏩ The time required by the video amplifier of the projector to increase its output from 10% to 90% of the maximum value.

RGB Video ⏭ The video output (analog or digital) of most computers. Analog RGB video can have 3, 4, or 5 wires - one each for red, green, and blue, and either none, one or two for sync. For three-wire RGB, the green wire usually provides sync. (See TTL Video).

RS-232 ⏭ A common asynchronous data transmission standard recommended by the Electronics Industries Association (EIA). Also called serial communication.

RS-422 ⏭ A less common asynchronous data transmission standard in which balanced differential voltage is specified. RS-422 is especially suited to long distances.

S-Video ⏭ The output from certain video tape players and video equipment. S-Video separates sync and luminance from color information, typically producing a higher quality display than composite video.

Scan Frequency ⏭ The horizontal or vertical frequency at which images are generated.

Scan Line ⏭ One horizontal line on the display.

SECAM ⏭ A video output format of some video tape and disc players (used primarily in France). SECAM (Sequential Couleur á Mémoire) signals are similar in resolution and frequency to PAL signals. The primary difference between the two standards is in the way color information is encoded.

Slidebar ⏭ A slidebar is a graphical display of an adjustable setting. The numerical setting often represents a percentage but can be a specific unit such as degrees Kelvin.

Source ⏭ The device, such as a computer or VCR, connected to the projector for display. A source is identified at the projector as Input1 , Input2 , Input3 , or Input4 , or as other user-defined numbers. A source may have numerous corresponding channels defined and recognized by the projector. See *Input*.

Source Setup ⏭ See *Channel*.

Spot Size ⏭ The diameter of the smallest dot that can be generated by a CRT projector. This projector has a fixed spot (pixel) size.

Sync ⏭ This term refers to the part of the video signal that is used to stabilize the picture. Sync can occur in three forms:

1) "Composite sync": the horizontal and vertical components are together on one cable.
2) "Sync-on-green": the sync is part of the green video.
3) "Separate sync" or "H.SYNC and V.SYNC": the horizontal and vertical components of the sync are on two separate cables.

Sync Width ⏭ The duration of each sync pulse generated by a computer. The sync width is part of the blanking time.

TTL Video ⏭ A type of RGB video with digital characteristics.

Terminated ⏭ A wire connecting a single video source to a display device, such as a projector, must be terminated by a resistance (usually 75Ω for video).

GLOSSARY

Throw Distance ⏭ The distance between the front feet of the projector and the screen. Also called "Projector-to-Screen Distance". Always use the correct throw distance formula to calculate the proper throw distance (±5%) required for your lens.

Tint ⏭ Balance of red-to-green necessary for realistic representation of NTSC signals.

Variable Scan ⏭ The ability of a projector to synchronize to inputs with frequencies within a specified range.

Vertical Frequency ⏭ The frequency at which images are generated. Vertical frequencies vary amongst sources. Also called vertical scan rate.

Vertical Offset ⏭ The difference between the center of the projected image and the center of the projector lens. For this projector, this value is expressed as the maximum percentage of the image that can be projected above or below the lens center without degrading the image quality. Vertical offset ranges depend on the type of lens in use, and whether or not the image is offset horizontally at the same time.

Video ⏭ The signal that is used by display devices (such as projectors) to generate an image. This term also refers to the output of video tape/disk players and computers.

Video Decoder ⏭ An optional device that converts NTSC 3.58, NTSC 4.4, PAL, PAL-N, PAL-M or SECAM to RGB video.

Video Standard ⏭ A specific type of video signal, such as NTSC, PAL, SECAM. This projector can automatically recognize and interpret the incoming standard and display accordingly.

Viewing Angle ⏭ Screens do not reflect equally in all directions. Most light is reflected in a conical volume centered around the "line of best viewing". Maximum brightness is perceived if you are within the viewing cone defined by the horizontal and vertical viewing angles.

White Balance ⏭ The color temperature of white used by the projector.

White Field ⏭ The area of an image that is white only. For example, a full white field is an image that is white everywhere. A 10% white field is a white area (usually rectangular) that occupies 10% of the image; the remaining 90% is black.

YCbCr ⏭ A high-end *digital* component video signal.

YPbPr ⏭ A high-end *analog* component video signal. Sometimes called YUV, Component, or Y, R-Y, B-Y, the YPbPr signal by-passes the video decoder in this projector.

YUV ⏭ See *YPbPr*.

Zoom ⏭ The adjustment of image size by means of a zoom lens.

KEYPAD REFERENCE

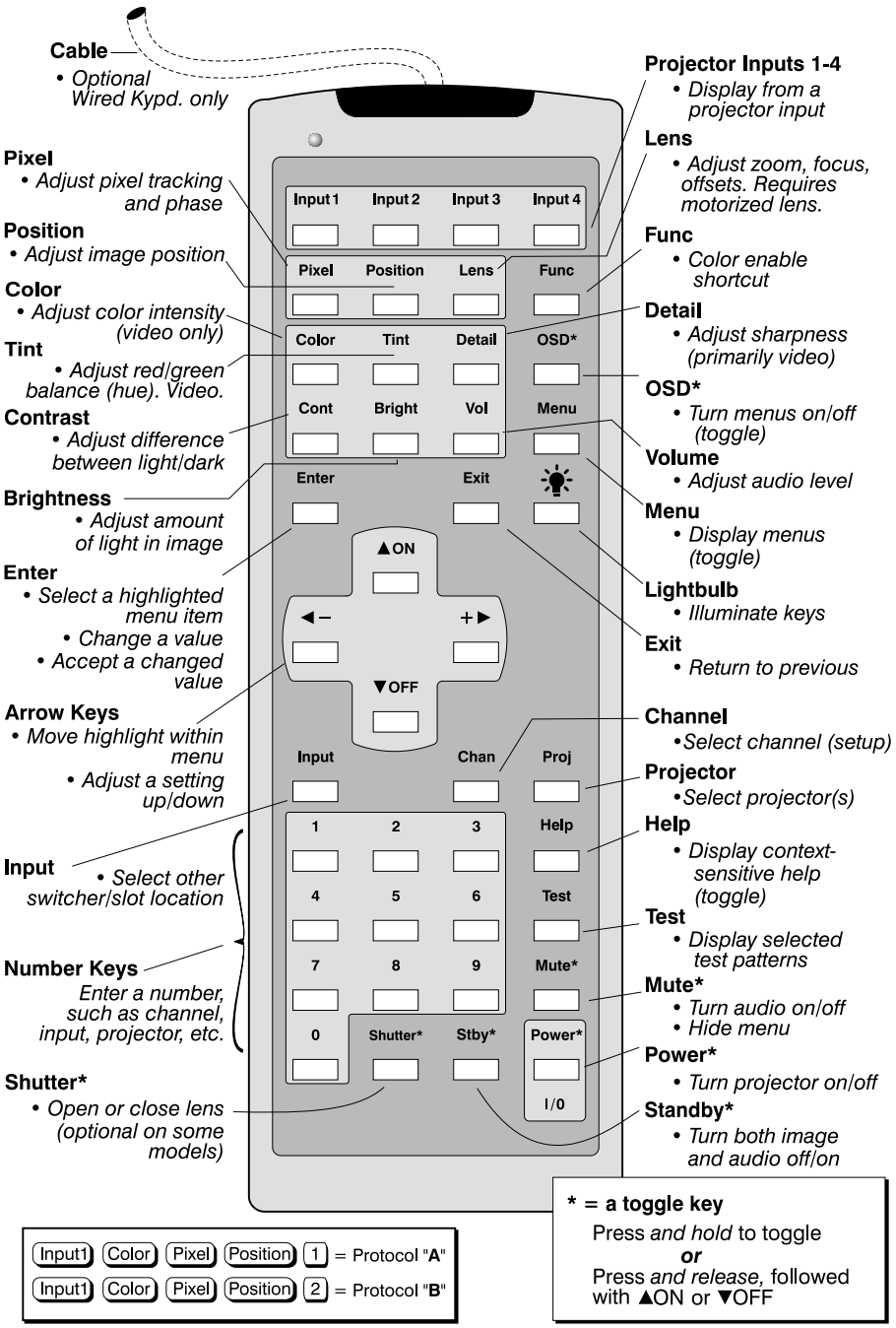
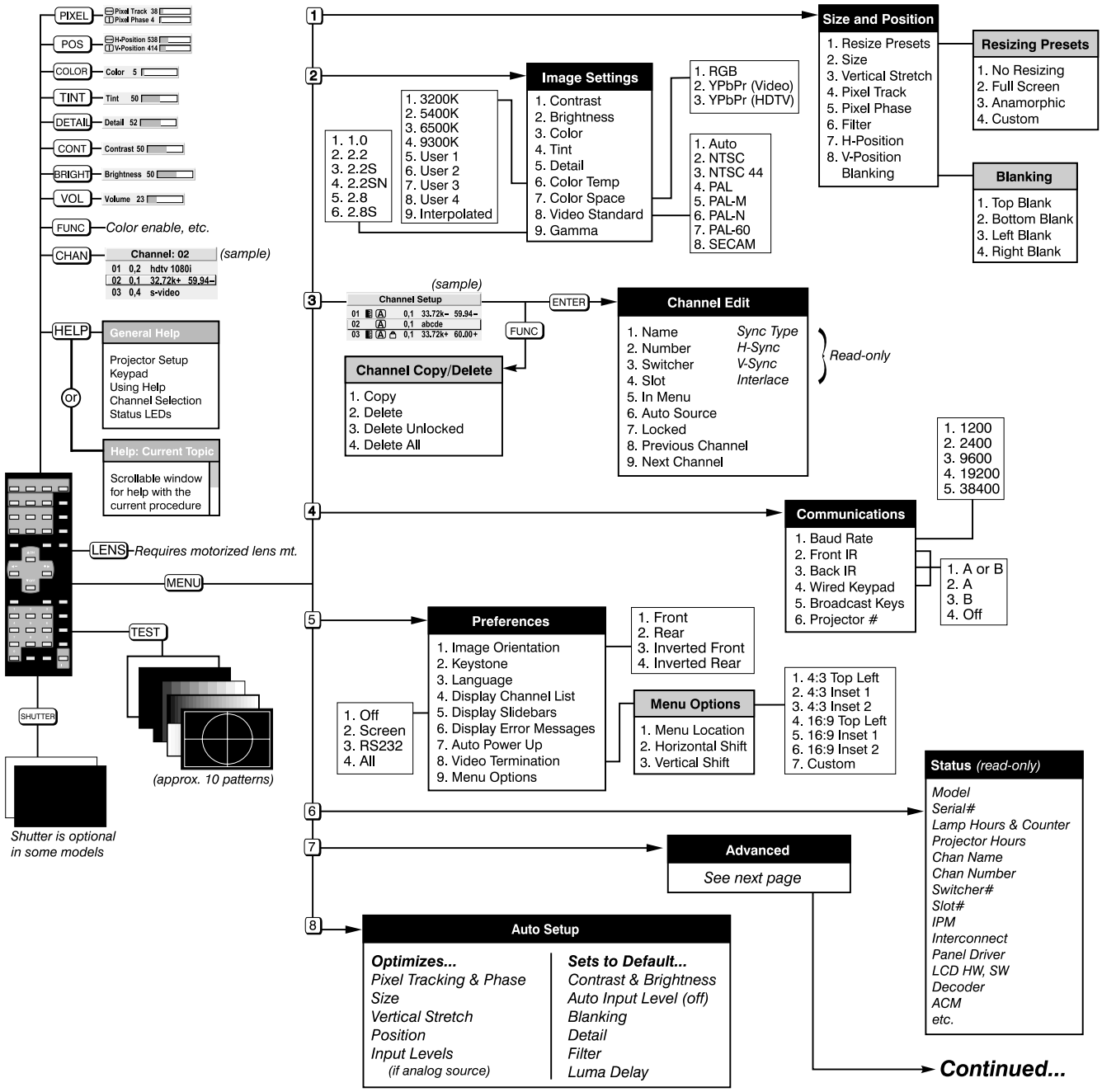


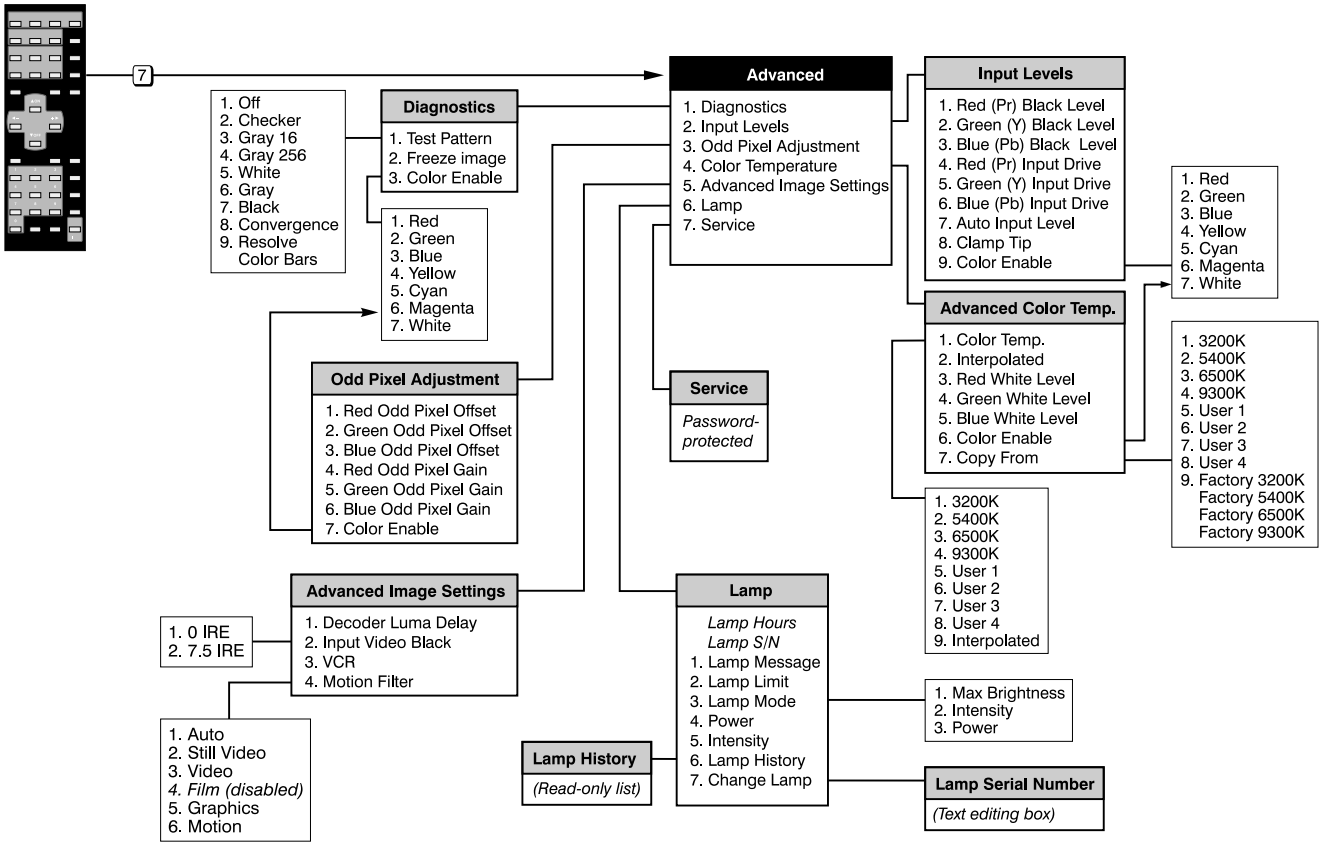
Figure B-1. Keypad

Menu Tree


PIXEL
Pixel Track 38
Pixel Phase 4
POS
H-Position 538
V-Position 414
COLOR
Color 5
TINT
Tint 50
DETAIL
Detail 52
CONT
Contrast 50
BRIGHT
Brightness 50
VOL
Volume 23
FUNC
Color enable, etc.
CHAN
Channel: 02
(sample)
01 0,2 hdtv 1080i
02 0,1 32.72k+ 59.94–
03 0,4 s-video
HELP
General Help
Projector Setup
Keypad
Using Help
Channel Selection
Status LEDs
or
Help: Current Topic
Scrollable window for help with the current procedure
LENS
Requires motorized lens mt.
MENU
TEST
SHUTTER
(approx. 10 patterns)
Shutter is optional in some models
1
Size and Position
1. Resize Presets
2. Size
3. Vertical Stretch
4. Pixel Track
5. Pixel Phase
6. Filter
7. H-Position
8. V-Position
Blanking
Resizing Presets
1. No Resizing
2. Full Screen
3. Anamorphic
4. Custom
Blanking
1. Top Blank
2. Bottom Blank
3. Left Blank
4. Right Blank
2
Image Settings
1. Contrast
2. Brightness
3. Color
4. Tint
5. Detail
6. Color Temp
7. Color Space
8. Video Standard
9. Gamma
1. 1.0
2. 2.2
3. 2.2S
4. 2.2SN
5. 2.8
6. 2.8S
1. 3200K
2. 5400K
3. 6500K
4. 9300K
5. User 1
6. User 2
7. User 3
8. User 4
9. Interpolated
1. RGB
2. YPbPr (Video)
3. YPbPr (HDTV)
1. Auto
2. NTSC
3. NTSC 44
4. PAL
5. PAL-M
6. PAL-N
7. PAL-60
8. SECAM
3
(sample)
Channel Setup
01 A 0,1 33.72k– 59.94–
02 A 0,1 abcde
03 A 0,1 33.72k+ 60.00+
ENTER
FUNC
Channel Edit
1. Name
2. Number
3. Switcher
4. Slot
5. In Menu
6. Auto Source
7. Locked
8. Previous Channel
9. Next Channel
Sync Type
H-Sync
V-Sync
Interlace
Read-only
Channel Copy/Delete
1. Copy
2. Delete
3. Delete Unlocked
4. Delete All
4
Communications
1. Baud Rate
2. Front IR
3. Back IR
4. Wired Keypad
5. Broadcast Keys
6. Projector #
1. 1200
2. 2400
3. 9600
4. 19200
5. 38400
1. A or B
2. A
3. B
4. Off
5
Preferences
1. Image Orientation
2. Keystone
3. Language
4. Display Channel List
5. Display Slidebars
6. Display Error Messages
7. Auto Power Up
8. Video Termination
9. Menu Options
1. Front
2. Rear
3. Inverted Front
4. Inverted Rear
1. Off
2. Screen
3. RS232
4. All
Menu Options
1. Menu Location
2. Horizontal Shift
3. Vertical Shift
1. 4:3 Top Left
2. 4:3 Inset 1
3. 4:3 Inset 2
4. 16:9 Top Left
5. 16:9 Inset 1
6. 16:9 Inset 2
7. Custom
6
Status (read-only)
Model
Serial#
Lamp Hours & Counter
Projector Hours
Chan Name
Chan Number
Switcher#
Slot#
IPM
Interconnect
Panel Driver
LCD HW, SW
Decoder
ACM
etc.
7
Advanced
See next page
Continued...
8
Auto Setup
Optimizes...
Pixel Tracking & Phase
Size
Vertical Stretch
Position
Input Levels
(if analog source)
Sets to Default...
Contrast & Brightness
Auto Input Level (off)
Blanking
Detail
Filter
Luma Delay

MENU TREE

...Continued



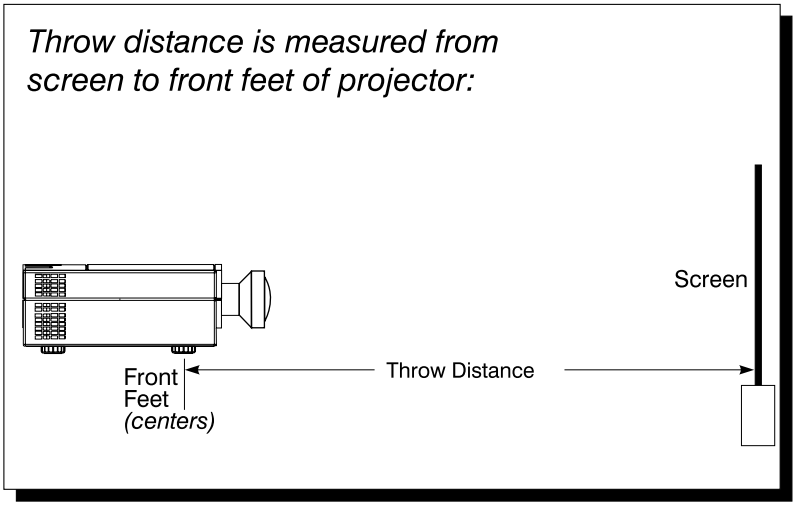
Appendix D

Throw Distance

Always consult this Appendix when planning a projector installation. See also 2.3, Projector Position and Mounting.

Calculating Throw Distance

Correct throw distance depends on the screen size and lens present-the larger the image needed, the greater the distance you must allow between the lens and screen. Once you know the screen size and lens type present, you can calculate the precise throw distance you require by using the appropriate formula as found in this appendix.



Throw distance is the distance between the projector front feet and the screen. This measurement is not necessarily parallel to the floor-i.e., the projector and screen may be inclined.

NOTE: If your projector is tilted up or down in relation to the screen, as is sometimes the case for large venues or elevated installations, throw distance still represents the smallest measurement between the screen and front feet centers.

Pre-calculated throw distances for the complete range of lens types and screen sizes appear in the charts and graphs on the following pages. Refer to these examples to quickly determine the proper throw distance (±5%) for your installation and lens.

NOTE: Variable operating ranges for zoom lenses appear in graphs only.

Table E-1. Throw Distance Formulas

Lens Throw Ratio	Throw Distance Formula (ft.) ±5%	Diagonal Screen Size (ft.)
***0.8:1* (Optional)**	***.79 x screen width (ft.) + .81***	***5-25***
***1.2:1* (Optional)**	***1.24 x screen width (ft.) + .82***	***5-30***
1.5-2.2:1 zoom	***Min: 1.52 x screen width (ft.) + .57*** ***Max: 2.26 x screen width (ft.) + .44***	***5-40***
2.2-4:1 zoom	***Min: 2.23 x screen width (ft.) + .61*** ***Max: 4.09 x screen width (ft.) + .36***	***5-40***
4-7:1 zoom	***Min: 4.03 x screen width (ft.) + .57*** ***Max: 7.13 x screen width (ft.) + .27***	***8-40***

NOTE: Make sure to use HORIZONTAL screen size in all formulas.

THROW DISTANCE

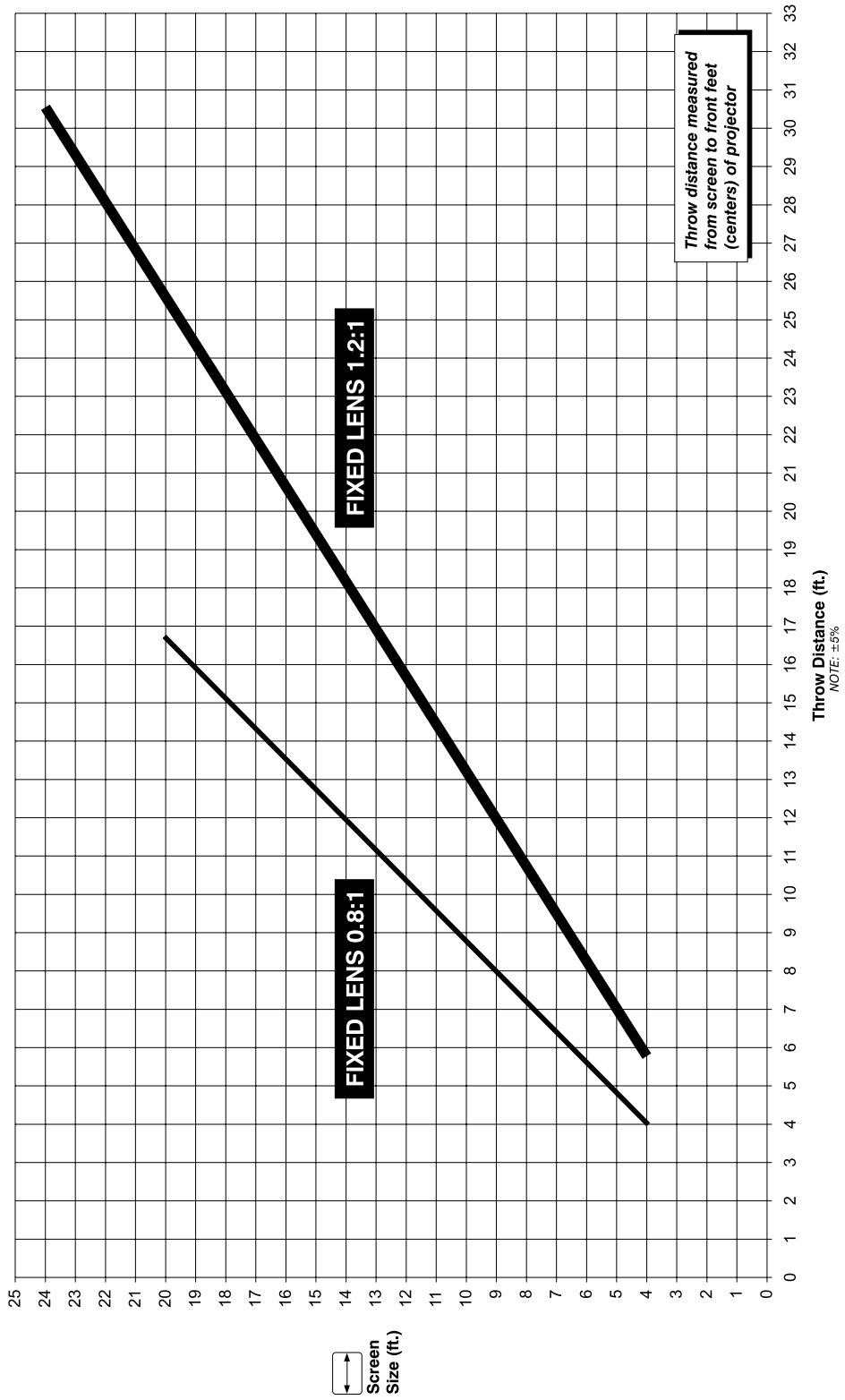
0.8:1 Fixed Lens** and **1.2:1 Fixed Lens

0.8:1 Lens	
Screen Width (ft)	Throw Distance (ft) *
4	3.98
4.5	4.37
5	4.77
5.5	5.16
6	5.56
6.5	5.96
7	6.35
7.5	6.75
8	7.14
8.5	7.54
9	7.93
9.5	8.33
10	8.73
10.5	9.12
11	9.52
11.5	9.91
12	10.31
12.5	10.71
13	11.10
13.5	11.50
14	11.89
14.5	12.29
15	12.68
15.5	13.08
16	13.48
16.5	13.87
17	14.27
17.5	14.66
18	15.06
18.5	15.45
19	15.85
19.5	16.25
20	16.64

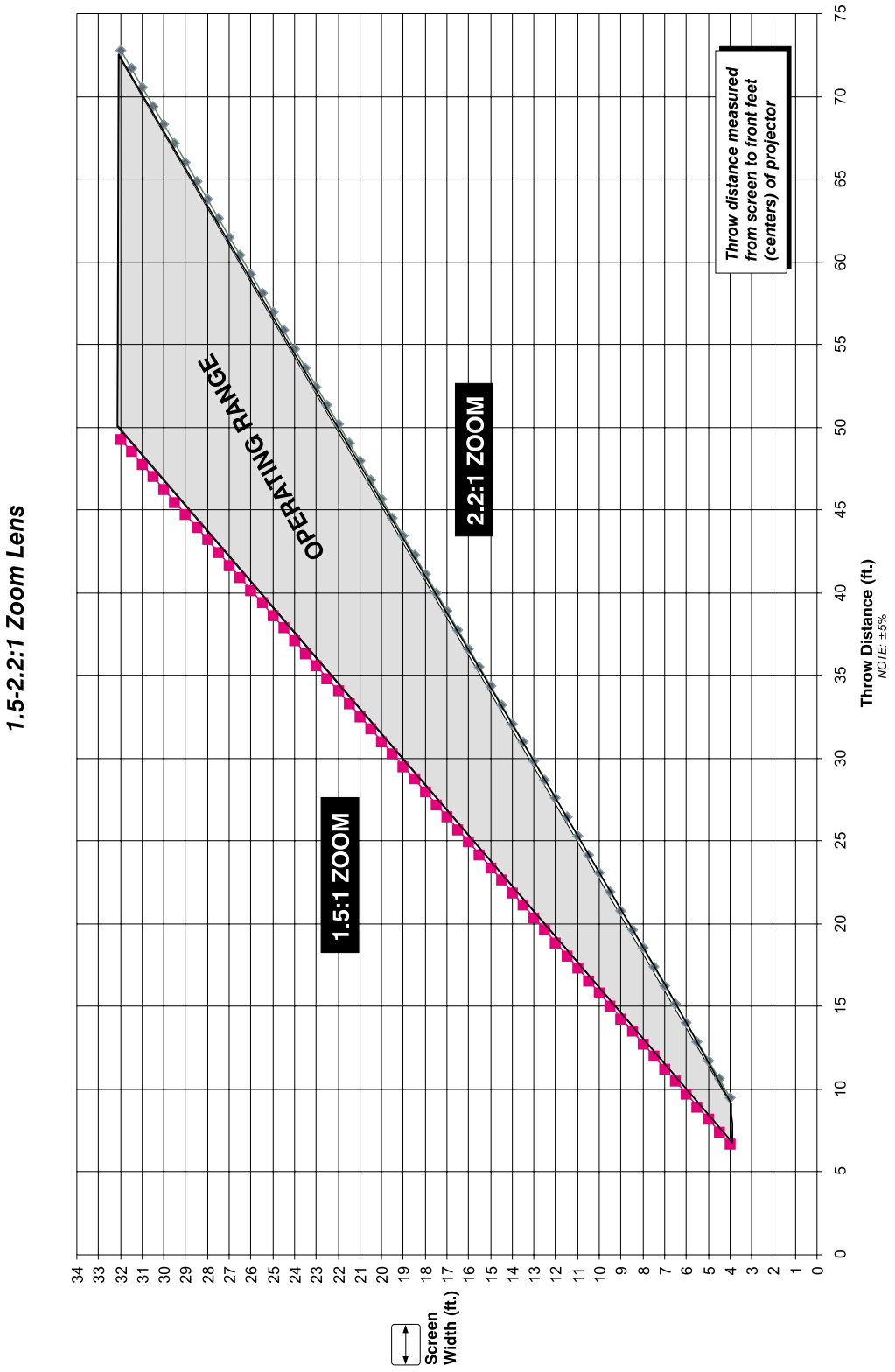
*NOTE: ±5%

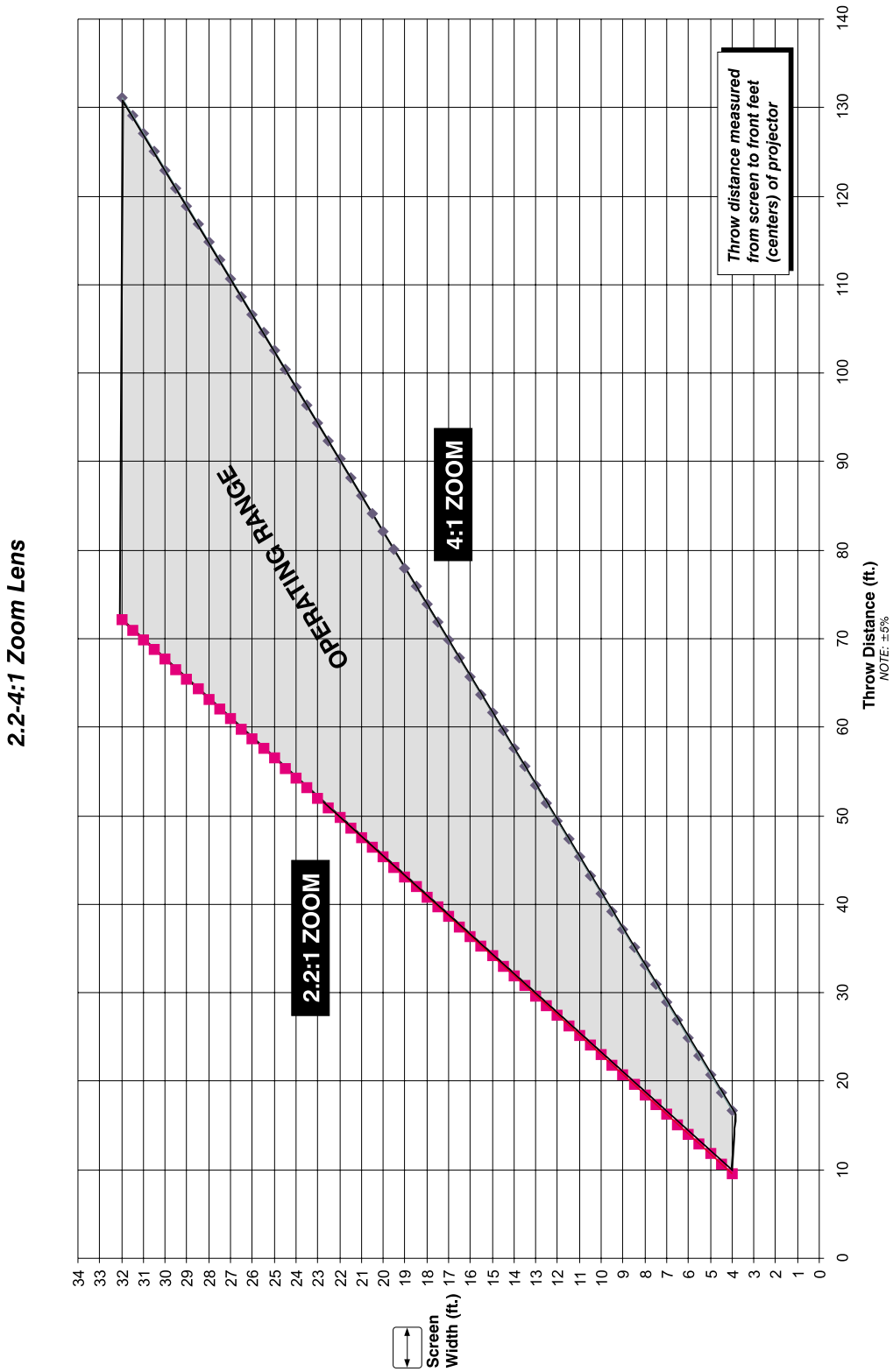
1.2:1 Lens	
Screen Width (ft)	Throw Distance (ft) *
4	5.78
4.5	6.40
5	7.02
5.5	7.64
6	8.25
6.5	8.87
7	9.49
7.5	10.11
8	10.73
8.5	11.35
9	11.97
9.5	12.59
10	13.21
10.5	13.83
11	14.45
11.5	15.07
12	15.69
12.5	16.30
13	16.92
13.5	17.54
14	18.16
14.5	18.78
15	19.40
15.5	20.02
16	20.64
16.5	21.26
17	21.88
17.5	22.50
18	23.12
18.5	23.73
19	24.35
19.5	24.97
20	25.59
20.5	26.21
21	26.83
21.5	27.45
22	28.07
22.5	28.69
23	29.31
23.5	29.93
24	30.55

0.8:1 Fixed Lens** and **1.2:1 Fixed Lens

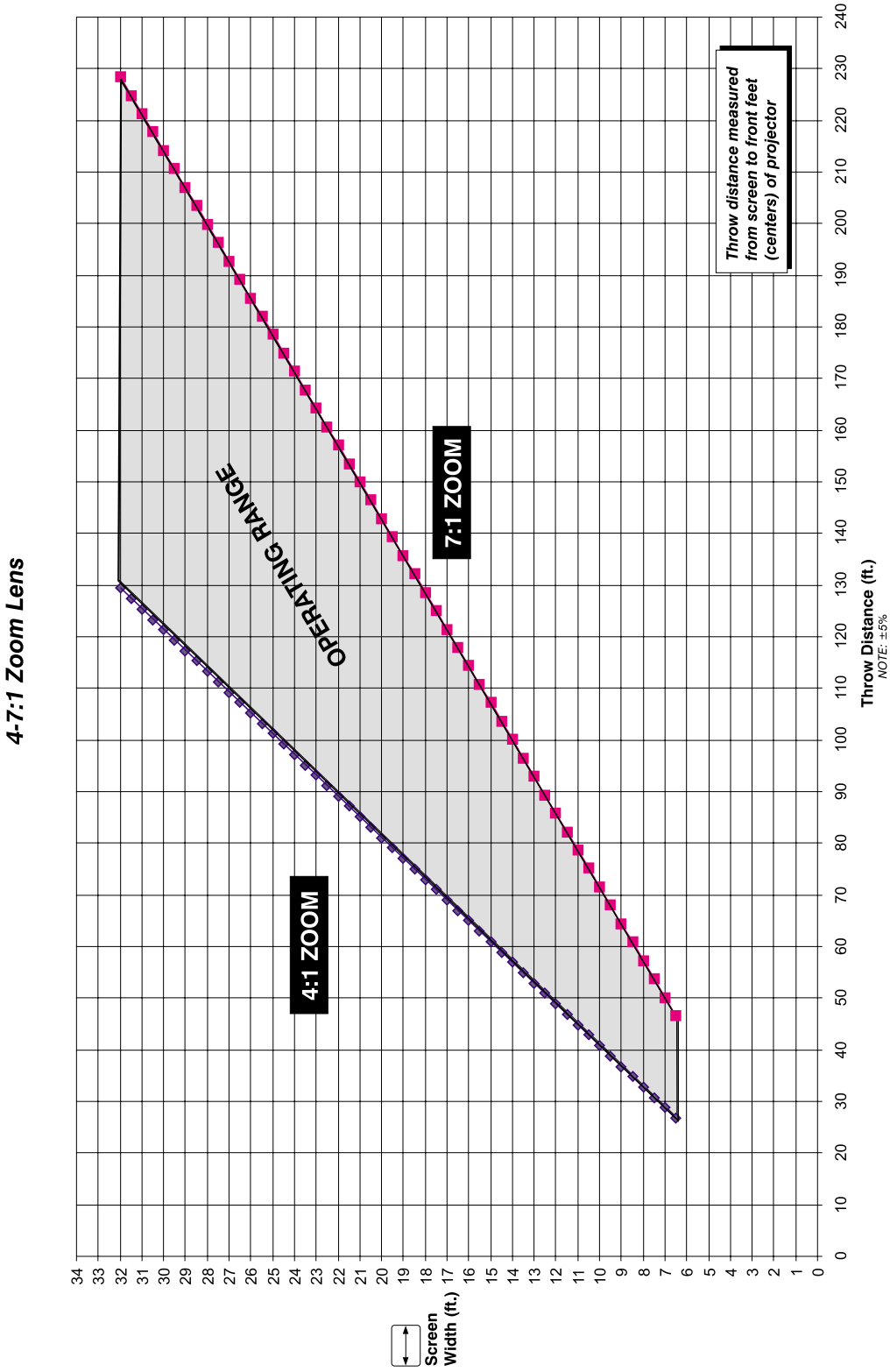

FIXED LENS 1.2:1
FIXED LENS 0.8:1
Throw distance measured from screen to front feet (centers) of projector
Throw Distance (ft.)
NOTE: ±5%
Screen Size (ft.)
0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32 33
0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25

THROW DISTANCE


1.5-2.2:1 Zoom Lens
Throw distance measured from screen to front feet (centers) of projector
OPERATING RANGE
1.5:1 ZOOM
2.2:1 ZOOM
Throw Distance (ft.)
NOTE: ±5%
Screen Width (ft.)
0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32 33 34
0 5 10 15 20 25 30 35 40 45 50 55 60 65 70 75


2.2-4:1 Zoom Lens
Throw distance measured from screen to front feet (centers) of projector
4:1 ZOOM
2.2:1 ZOOM
OPERATING RANGE
Throw Distance (ft.)
NOTE: ±5%
Screen Width (ft.)
0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32 33 34
0 10 20 30 40 50 60 70 80 90 100 110 120 130 140

THROW DISTANCE



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